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BULLETIN OF THE TORREY BOTANICAL CLUB

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THE EMBRYOLOGY OF EPIDENDRUM PRISMATOCARPUM

B. G. L. SWAMY

Nearly seventy years ago, Treub (1879) reported a very interesting type of suspensor development in the embryogeny of *Epidendrum ciliare*. The suspensor of this species consists of a loose mass of a large number of bulged-out cells, the entire structure appearing to be more or less equal to the embryonal mass in volume. Sharp (1912), during his investigations on the orchid embryo sac, made some observations on the early embryo of *E. cochleatum*. Though his treatment is very fragmentary and incomplete, his figures suggest a possibility of the development of a suspensor similar to that of *E. ciliare*, studied by Treub. Thus Treub's record is the only authentic example of the kind till the present day.

In a casual survey of the types of suspensors of orchids, the present writer (1947) found that certain types of suspensor organization were confined in general to specific tribes of the family. Among other points of interest, it was noted that the type of suspensor seen in *E. ciliare* was unique in that a similar type was not encountered in any other genus of the family. Further, it was suggested that an investigation of other members of the tribe Laeliinae would probably reveal the same fundamental pattern of suspensor organization as the one shown by *E. ciliare*, thereby providing additional data for generalizations. Mr. R. S. Wharton of the Biological Laboratories of Harvard University was kind enough to place at my disposal a flowering plant of *E. prismatocarpum* Reichenb., and I hereby express my gratitude to him. The flowers were artificially pollinated and the present study is based on the material obtained therefrom.

Megasporogenesis and Embryogeny. After pollination, mitotic activity becomes suddenly accelerated in the cells of the placental tissue and the placental ridges send out numerous protuberances which repeatedly branch in a dichotomous fashion. Each ultimate branch consists of a filamentous row of 4–6 nucellar cells surrounded by the epidermis. The terminal nucellar cell of each filament differentiates into the archesporium, which directly functions as the megaspore mother cell.

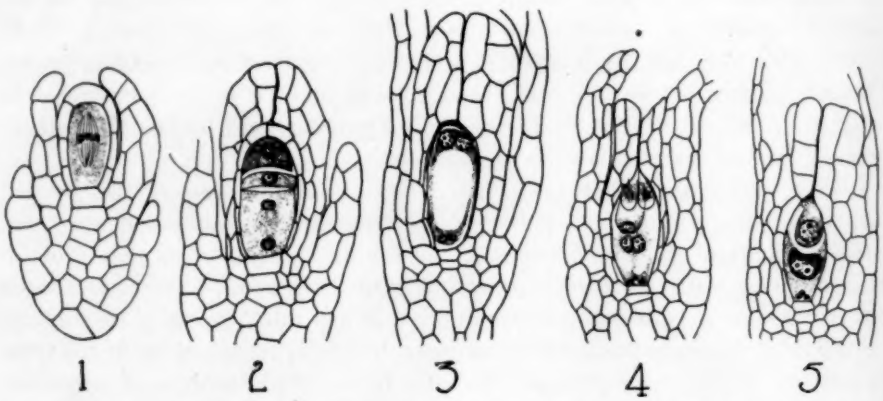
The inner integument originates first, and the outer slightly later when the megaspore-mother cell is passing through the first meiotic division (fig. 1). As in other orchids, the outer integument outgrows the inner, leaving an empty space between at the micropylar end (figs. 4, 5).

The meiotic divisions result in a "row of three cells," the micropylar cell representing the undivided dyad cell and the two others the megaspores (fig.

[THE BULLETIN for March–April (75: 131–244) was issued March 10, 1948]

2). The nucleus of the chalazal megaspore divides thrice to give rise to an 8-nucleate embryo-sac. In passing it may be noted that the antipodal nuclei at the 4- and 8-nucleate stages of the embryo-sac appear very much diminished in size (figs. 3, 4).

In *E. variegatum* Sharp (1912) observed occasional instances of the *Adoxa* type of development of the female gametophyte. Judging from his figures (e.g. fig. 8, which shows a pronounced vacuolation, characteristic of a typical 2-nucleate sac of the Normal type) such a condition seems improbable, excepting perhaps as a very rare abnormality. Pfitzer (1880) has not recorded any atypical features in the gametogenesis of *E. ciliare;* nor was I



FIGS. 1–5. FIG. 1. Megaspore-mother cell in metaphase I; ×1200. FIG. 2. "Row of three cells," the micropylar cell representing the undivided dyad cell, the middle one a megaspore and the chalazal cell representing the 2-nucleate embryo-sac; ×1200. FIG. 3. 4-nucleate embryo-sac; ×1200. FIG. 4. Mature embryo-sac; ×800. FIG. 5. Zygote and the degenerating primary endosperm nucleus; ×800.

able to observe any other type of development excepting the Normal type in the species studied at present.

Double fertilization is accomplished normally but the primary endosperm nucleus promptly degenerates. The zygote (fig. 5) rests for 40–45 days and then divides by a transverse wall (fig. 6*a*). The basal cell divides again in the same plane whereas the terminal cell does so in a vertical plane (fig. 6*b*) to result in a 3-celled tier, the chalazal tier consisting of two cells (fig. 6*c*). Cells constituting the micropylar and middle tiers (suspensor initial cell and the middle cell respectively) by repeated transverse divisions develop into a filament of 8–10 cells (fig. 6*d–h*). Subsequently oblique and vertical divisions occur in the cells of the filament and each resultant cell bulges out (fig. 6*i–k*) so that the mature stage presents the characteristic appearance as illustrated in figure 6l. The cells constituting the chalazal

tier (fig. 6*c*) develop into the embryonal mass proper as depicted in figure 6*d–l*.

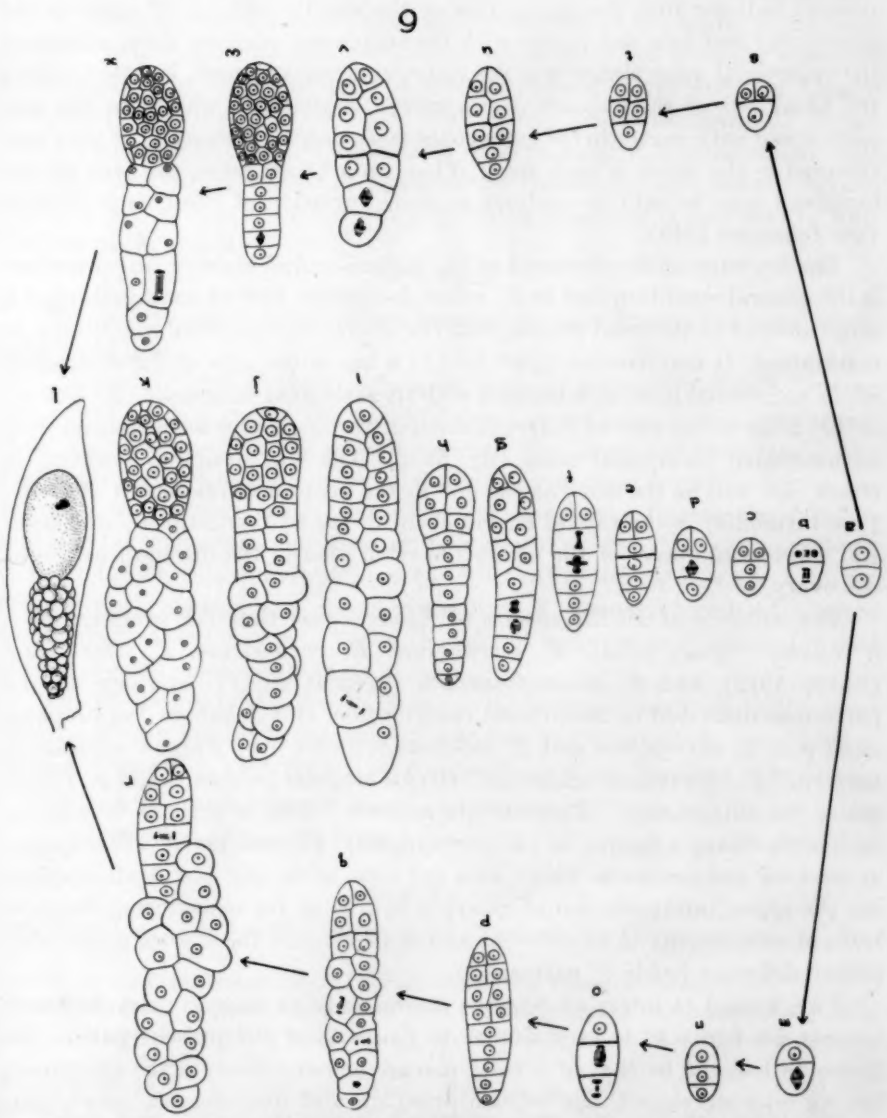


FIG. 6. Figures illustrating the development of the suspensor and embryo. For explanation see text. All figures × 1200, excepting figure *l*, which is × 400.

The behavior of the middle cell (of the stage represented in fig. 6*c*) calls for comment. The difficulty of drawing a line between the suspensor and the

embryo especially during the early stages of development of this pattern has already been expressed by Johansen (in preparation). My observations at present indicate that the derivatives of the middle cell cut off towards the micropylar end join and merge with the suspensor, whereas those adjoining the embryonal mass merge into the embryonal mass proper. In other words, the basal cell of the two-celled proembryo contributes wholly to the suspensor and only partly to the embryonal mass proper, although the part contributed to the latter is very small. Thus, on a broad basis, the type of embryogeny may be said to conform to some variation of the Onagrad Type (see Johansen 1945).

The sequence of development of the suspensor and embryo just described is the general condition met in *E. prismatocarpum*. But an examination of a large amount of material reveals that the above sequence may not always be maintained. It may become upset by (1) a lag in the rate of differentiation of the embryonal mass as compared with its associated suspensor (fig. 6*m–r*), or (2) a lag in the rate of differentiation of the suspensor as compared with its associated embryonal mass (fig. 6*s–x*). The end product, however, in either case will be the same as the one in the general development (fig. 6*l*). This variability in the rate of development of the two structures—suspensor and embryonal mass—of the embryo is often seen in the different ovules of one ovary.

The embryos of all the species of *Epidendrum* thus far investigated—*E. ciliare* (Treub 1879), *E. verrucosum*, *E. variegatum*, *E. cochleatum* (Sharp 1912), and *E. prismatocarpum* (present study)—conform to one pattern as described in the present contribution. But Johansen (in preparation) puts *E. variegatum* and *E. cochleatum* under his "*Epipactis palustris pattern*," *E. verrucosum* under his "*Orchis latifolia pattern*," and *E. ciliare* under the independent "*Epidendrum pattern*." This is perhaps because he interprets Sharp's figures 16 (*E. verrucosum*), 17, and 18 (*E. cochleatum*) as showing end products. There does not seem to be any justification either for the above interpretation of Sharp's figures or for considering the patterns of embryogeny to be different and to pigeonhole the species under altogether different heads ("patterns").

I am moved to interpret Sharp's figures only as stages in development, because his figure 17 is very similar to figure 6*j* of the present paper. His figure 18 looks to be that of a fully mature embryo wherein the suspensor, having once developed, has become dried up and disappeared, which condition happens very commonly in orchids. Regarding Johansen's classifying *E. verrucosum* under his "*Orchis latifolia pattern*," it must be stated that this is not at all justifiable, because the type of embryogeny exhibited by the latter is wholly different from the one shown by the former. *Orchis* (and all the genera of the tribe Ophrydinae thus far investigated) shows a pattern

of suspensor which is unique in the family (Swamy 1946). That is, the suspensor behaves as a typical "extra-ovular haustorium" whereas in the species of *Epidendrum* this organ does not extend out of the limits of the seed cavity. Further, Sharp's figure 16, which apparently has been the basis for the step taken by Johansen, may be best interpreted as representing a stage in development, because this figure very closely resembles figure 6*h* of the present paper. Thus from the available data on hand it may be stated with certainty that all the species of *Epidendrum* studied till now exhibit fundamentally the same type of embryogeny, which character speaks for the uniformity of the genus.

SUMMARY

The embryo-sac of *Epidendrum prismatocarpum* follows the monosporic 8-nucleate type.

The first division of the zygote takes place by a transverse wall. During the second cell generation, the wall laid down in the basal cell is again transverse and that in the terminal cell vertical. The basal cell gives rise to the suspensor and to a small portion of the embryonal mass proper, whereas the terminal cell develops wholly into the embryonal mass. During the development of the suspensor, the basal cell divides to form a filamentous row of cells, which by subsequent oblique and vertical divisions develops into the characteristic mature suspensor, resembling a compact bunch of grapes. Occasionally there may be a lag in the rate of maturation of either the suspensor or of the embryonal mass proper.

All the species of *Epidendrum* so far investigated conform to the same pattern of embryogeny. Johansen's method of treatment of the classification of orchid embryos with regard to *Epidendrum* is not justified.

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Literature Cited

Johansen, D. A. 1945. A critical survey of the present status of plant embryology. Bot. Rev. **11**: 87–107.

————. Plant embryology. [In preparation. The Chronica Botanica Co.]

Pfitzer, E. 1880. Beobachtungen über Bau und Entwicklung der Orchideen. 5. Zur Embryoentwicklung und Keimung der Orchideen. Verh. Nat.-Med. Ver. Heidelberg **2**: 23–30.

Sharp, L. W. 1912. The orchid embryo sac. Bot. Gaz. **54**: 373–385.

Swamy, B. G. L. 1946. Embryology of *Habenaria*. Proc. Nat. Inst. Sci. India **12**: 413–426.

————. 1947. On the suspensor types in orchids and their significance. Am. Jour. Bot. **34**: Suppl. 12 a.

Treub, M. 1879. Notes sur l'embryogénie des quelques Orchidées. Verb. Akad. Amsterdam Natuurk. **19**: 1–50.

BULLETIN OF THE TORREY BOTANICAL CLUB
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DIFFERENCE IN FORM AND REACTION TO COLD IN ROOT-TIP AND APICAL BUD CHROMOSOMES OF MEDEOLA[1]

T. M. WOODARD, JR.

Introduction. Darlington and La Cour (1940) showed that the somatic chromosomes of *Trillium* and *Paris* develop numerous understained segments when the plants are grown for an appropriate time at temperatures near 0° C. They found these special segments to be highly specific, both as to location and number within the chromosome and the species. They attributed this reaction to nucleic acid starvation and suggest that the segments represent heterochromatic regions of the chromosomes which are to be identified with the chromocenters of the resting nucleus. This interpretation of the nature of the special segments has been challenged by Resende, de Lemos-Pereira and Cabral (1944), who suggest, in turn, that the special segments are nucleolar zones. Darlington and La Cour found also that the chromosomes of several other plants grown at low temperatures develop no such differential segments but undergo, instead, marked contraction, a type of reaction now well known and, apparently, quite common (see Geitler 1938; Warmke 1946). Darlington and La Cour claim that only in the Parideae is the production of such special segments shown as the effect of cold.

There are a number of accounts of chromosome constrictions produced by cold, special fixatives, special methods of growing the material, or combinations of these factors. These cases are all reviewed by Wilson and Boothroyd (1941). Constrictions have been known to occur sporadically without any assignable cause. In arctic species of certain plants an exceptionally high number of secondary constrictions is to be found normally. Whether or not such constrictions are identical with special segments is uncertain. There is too little information as yet to justify any general conclusions in regard to the specific cause or the exact nature of all such segments. In spite of this uncertainty, however, the rather remarkable specificity as to location and number of the special segments, in *Trillium* at least, constitutes a morphological characteristic. They may thus play a role as specific markers in comparative analysis of chromosome complements. It becomes of interest, therefore, to inquire how the chromosomes of *Medeola*, another member of the Parideae, would react to low temperature. This was the purpose of the work to be described.

[1] The writer is indebted to the Natural Science Division Research Fund, Vanderbilt University, for grants made in support of this work.

Methods. Some 65 rhizomes of *Medeola virginiana* were obtained at Highlands, N. C., in July 1946. They were kept in pots in peat moss in a controlled temperature chamber (about 20° C); after several weeks, when a new crop of root-tips had appeared, the tips and apical buds of some of the plants were prepared for study of the normal chromosomes. Other plants were transferred to a commercial refrigerator in which they stayed for 96 hours. A recording thermometer indicated a temperature within the refrigerator of 1.6° C, with a variation of less than one degree throughout the period of cold treatment. Both treated and untreated buds and tips were fixed in Flemming-Benda fixing fluid and prepared as squashes after being treated by the Feulgen method.

Observations. *Normal Chromosomes.* Figure 2 shows a typical metaphase complement of 14 chromosomes found in apical bud cells. Measurements of the size of the bud chromosomes and calculation of arm-ratios were made for eight chromosomes of each type. These data were found to agree closely with those of Stewart and Bamford (1942), who described the mitotic and meiotic chromosomes of the flower bud of *Medeola*. For details of chromosome form their paper may be consulted.

The untreated chromosomes of root-tips at metaphase and anaphase especially (fig. 6) are strikingly different in form from those of the apical bud (cf. fig. 2). There are a number of accounts in the literature of differences in chromosome form within the individual, but there appear to be few, if any, cases on record in which such differences are as marked as in *Medeola*. While the metaphase chromosomes in the apical bud are relatively short and of considerable breadth, those of the root-tip are much longer and narrower, almost thread-like in form in early pro-metaphase (fig. 4). That this difference in form is a result of difference in the degree of condensation and not in volume is shown by measurements. Four complete metaphase or anaphase groups of each type were drawn and measured, and it was found that the average volume of chromatin was the same in each approximately.

In addition to this form difference, there is another characteristic difference in behavior between apical bud and the root-tip chromosomes. While the metaphase stage in apical bud cells (fig. 2) is characterized by complete chromatid fusion, i.e., temporary disappearance of the line of separation of the two chromatids of each chromosome, in root-tip nuclei chromatid fusion and condensation apparently never advance to this point before separation of chromatids occurs at anaphase. Figure 5 represents a pro-metaphase stage in mitosis in a root-tip. This particular stage, it is believed, was near full metaphase when fixed. For if comparison is made with an anaphase (fig. 6) it will be seen that by anaphase very little, if any, further chromosome contraction has taken place beyond that present in the pro-metaphase stage shown. Comparison of figures 5 and 2 will indicate this difference in behavior during mitosis at the time when it is most marked.

This marked difference between apical bud and root-tip chromosomes in the degree of condensation appears to be in evidence at every stage through-

FIG. 1. Prophase in apical bud cell. FIG. 2. Metaphase in apical bud cell. FIG. 3. Anaphase group in apical bud cell after cold treatment. FIG. 4. Prophase in root tip cell. FIG. 5. Late pro-metaphase in root tip cell. FIG. 6. Anaphase in root tip cell. FIG. 7. Metaphase showing diplochromosomes in root tip cell after cold treatment. All drawings were made with a camera lucida, using a 2 mm. apochromatic objective and a 30× compensating ocular. The magnification of all figures, after reduction, is 1778×.

out the entire mitotic process in the two types of tissue. If one may assume that the amount of relational coiling of the chromatids of each chromosome

serves as an accurate index of the progress of prophase, then prophases which are comparable on this basis always show the same degree of difference in contraction, the chromosomes of the apical bud being at any comparable stage shorter and broader than those of the root-tip (cf. figs. 1 and 4).

Cold-treated Chromosomes. Figure 3 shows the appearance of an anaphasic group of apical bud chromosomes after cold treatment. No difference in length of the cold-treated as compared with the normal chromosomes (cf. figs. 2 and 3) could be detected. There does appear to be a slight increase in the diameter of the treated chromosomes, but this is so small as to be due, possibly, to differences in pressure arising during the squashing process. No diplochromosome groups were found in any of the slides of treated bud chromosomes, and no evidence of polyploidy was observed. A number of apparently normal anaphases were observed, indicating that the temperature at which the plants were grown was not low enough to prevent mitosis.

When treated root-tip chromosomes at metaphase are examined, on the other hand, it is found that marked contraction has been induced. Diplochromosome groups, similar to those observed in many other plants after cold treatment, are frequent (fig. 7). The length and diameter of the individual chromatids are approximately the same as those of the homologous untreated chromosomes of the apical bud (cf., figs. 7 and 2).

Note that in neither the apical bud nor the root-tip chromosomes are any constrictions to be observed after cold treatment other than those present in the untreated chromosomes. The apical bud chromosomes of *Medeola* show neither contraction nor special segment formation after cold treatment. So far as the writer is aware no wholly negative response of this kind to cold has been recorded, except when the temperature was low enough to produce pathological mitosis or to prevent mitosis. The root-tip chromosomes show marked decrease in length with increased chromatid diameter after cold treatment, behaving in this respect like the chromosomes of so many other plants.

Discussion. It has been shown by Resende, De Lemos-Pereira and Cabral (1944) that contraction and the production of special segments as a result of low temperature are not mutually exclusive processes but may occur simultaneously. Special segments appear, according to these authors, only when plants are grown at temperatures below some specific minimum. Since the observations on *Medeola* recorded here were limited to a single temperature, it cannot be concluded that such segments would never appear in this plant. It might be pointed out, however, that the temperature in these experiments was lower than that found necessary to produce such segments in *Trillium* and *Paris*.

In spite of the rather unexpected observation that the chromosomes of *Medeola*, unlike those of the related genera, *Trillium* and *Paris*, develop

no special segments after cold treatment, the preceding observations are of some interest from two other standpoints, namely, that of the difference in form between the chromosomes in different parts of the same organism and that of the difference in behavior of apical bud and root-tip chromosomes at low temperatures.

There are a number of instances on record of inter- and intra-individual variation in chromosome form (for summary see Geitler 1938). Inter-individual differences may in many cases be ascribed clearly to genotypic factors (see Darlington 1937). With regard to intra-individual differences, however, any general explanation of their cause is less evident. If such differences have a common cause, it must obviously be sought in phenotypic factors, such as the speed of the mitotic process, spatial relationships affecting the synthesis of chromosomal substance, alterations of the spiralization cycle, etc.

In the plant *Medeola*, the writer has observed a marked difference in the form of the metaphase chromosomes in the apical bud as compared with those in root-tips. This difference obtains, apparently, throughout the entire mitotic process. When these two tissues are subjected to low temperature at the same time the chromosomes of the root-tip undergo marked contraction; those of the bud, however, show no change. It seems reasonable to infer that the form difference which normally exists in this plant is a result of a different physiological state, related in some way to temperature; this inference appears to be especially justified in view of the fact that the difference in form may be equated by growing the plants at a lower temperature than that to which they are as a whole normally subjected. In view of the difference in form between bud and root-tip chromosomes and their differential behavior to low temperature one wonders whether or not this difference may have resulted as an adjustment on the part of the bud chromosomes to the lower temperature prevailing naturally near the surface of the soil as the buds approach it.

SUMMARY

The root tip chromosomes of *Medeola* are longer and of less diameter than those of the apical bud at comparable stages throughout the entire mitotic process. The volumes of the whole complements are the same. When plants are kept at 1.6° C, for 96 hours the apical bud chromosomes undergo no obvious change in form; those of the root tip undergo condensation until at metaphase they have approximately the same form as bud chromosomes. Diplochromosomes are produced at metaphase in the cells of cold-treated root tips but not in those of apical buds.

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Literature Cited

Darlington, C. D. 1937. Recent advances in cytology. ed. 2. Philadelphia.

Darlington, C. D. & La Cour, L. 1940. Nucleic acid starvation of chromosomes in *Trillium*. Jour. Genet. **40**: 185–213.

Geitler, L. 1938. Chromosomenbau. Berlin.

Resende, F., de Lemos-Pereira, A. & Cabral A. 1944. Sur la structure des chromosomes dans les mitoses des meristemes radiculaires. Port. Acta Biol. **1**: 9–46.

Stewart, R. N. & Bamford, R. 1942. The chromosomes and nucleoli of *Medeola virginiana*. Am. Jour. Bot. **29**: 301–303.

Warmke, H. E. 1946. Precooling combined with chrom-osmo-acetic fixation in studies of somatic chromosomes in plants. Stain Tech. **21**: 87–91.

Wilson, G. B. & Boothroyd, E. R. 1941. The rate and degree of differentiation in the somatic chromosomes of *Trillium erectum* L. Canad. Jour. Res. C. **19**: 400–412.

BULLETIN OF THE TORREY BOTANICAL CLUB
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A SEARCH FOR VIRUS INHIBITORS AMONG SOIL ACTINOMYCETES ANTAGONISTIC TO BACTERIOPHAGES

ALBERT SCHATZ[1] AND HILDEGARD PLAGER

This report presents the results of tests of the effect of fifty-four antiphage actinomycetes on a rodent-paralyzing virus (MM), and of related studies with bacterial viruses. The work was undertaken because of the relative ineffectiveness of antibiotics and other microbial products against most viruses (1–7). Microorganisms so far studied and reported to antagonize viruses include bacteria (1, 3, 4, 8), a pleuropneumonia-like organism (9), actinomycetes (1, 5, 6), yeasts (8), filamentous fungi (1, 4, 7, 8), and protozoa (10). Reports have appeared describing the effect of agents of synthetic and microbial origin on infections caused by filterable pathogens in animals (11–14) and plants (15–16). Our studies were limited to a group of actinomycetes with known antiphage properties (5, 6). MM (17) was chosen as the test virus for several reasons. It is well suited to experimental studies, induces polymyelitic lesions, and has been extensively studied in this laboratory.

Methods. Mouse brains, stored in glycerol, from the 43d to 48th generations of the MM strain of virus were pooled, ground with sand in salt solution containing 10 per cent infusion broth, centrifuged to remove large particles, and the supernatant fluid employed immediately or after storage in the dry-ice box. Albany mice[2] weighing 10–12 grams were injected intraperitoneally. The majority of animals given 0.05 ml. of a 0.5×10^{-6} dilution of mouse brain were usually dead or paralyzed by the seventh day. Unless otherwise specified, all animals were observed for seven days.

To determine inactivation of the virus by actinomycetes, two parallel streaks of each microorganism were made approximately 15 mm. apart across the center of glycerol–yeast-extract–agar[3] plates seeded with a 10^{-3} dilution of mouse-brain virus, as illustrated in Figure 1. After incubation for 48 and 96 hours at about 28° C, agar discs, removed from between the streaks and from an uninoculated control plate by pressing down with an 11- by 75-mm. test-tube, were triturated with sand in distilled water. The

[1] Present address: The Sloan-Kettering Institute for Cancer Research, Memorial Hospital, New York, N. Y.

[2] A strain used at the Division of Laboratories and Research, New York State Department of Health, Albany, N. Y.

[3] Glycerol 25 ml., yeast extract 3 gm., NaCl 2 gm., K_2HPO_4 1 gm., $MgSO_4$ 0.2 gm., $FeSO_4$ 0.01 gm., agar 15 gm., tap water 1000 ml., about pH 7.0.

supernatant fluid, after centrifugation, was assayed for virus, usually at dilutions of approximately 10^{-5} and 10^{-6} of the original brain material. The final pH of the medium was determined after 96 hours by a drop or two of bromothymol blue indicator placed on the agar surface between the streaks. This procedure was somewhat similar to the virus-seeded agar disc technic

FIG. 1. Method of testing for antagonistic action of soil actinomycetes against MM virus incorporated in an agar medium.

employed by Johnson (18) to determine the effects in vitro of the various chemical agents on tobacco mosaic virus.

The actinomycetes were also grown as stationary cultures in 500-ml. Erlenmeyer flasks containing 100 ml. of peptone-meat extract, glucose-tryptone, and glycerol-yeast extract semisolid broth of the same composition employed for previous studies with bacteriophages (6). After incubation at about 28° C for 10–12 days the cultures were filtered through sterile paper.

In vitro assays were carried out by incubating equal volumes of test material and mouse-brain virus dilutions at room temperature for one hour or overnight, as indicated. Intraperitoneal inocula consisted of 0.05-ml. portions of these mixtures. For toxicity tests two mice were each given intraperitoneally 1-ml. portions of the filtrates twice daily over a 5-day period. The same schedule was followed for in vivo studies with animals infected one hour after the first treatment. Five mice were employed for each in vitro and in vivo assay. Appropriate controls with sterile culture medium and virus were included throughout.

TABLE 1. *Effect of antiphage actinomycetes on MM virus incorporated in agar media.*

Tests after 96 hours' incubation at about 28° C

Actinomyces No.	Agar medium	Final pH of agar	Fate of mice inoculated with virus dilution[a]	
			10^{-5}	10^{-6}
25	Glucose-tryptone	7.6	2/5	4/5
28	" "	7.5	1/5	2/5
44	" "	< 6.0	4/5	3/5
79–D	" "	6.1	0/5	4/5
Control	" "	6.7	0/5	3/5[b]
19–D	Glycerol-yeast extract	7.1	1/5	3/5
43–D	" " "	7.2	1/5	4/5
46–D	" " "	7.4	2/5	3/5
47	" " "	7.3	3/5	3/5
48	" " "	7.0	1/5	0/5
56	" " "	7.2	0/5	2/5
79	" " "	6.7	3/5	2/5
98	" " "	6.1	5/5	5/5
193–B	" " "	6.6	0/5	3/5
A. griseus[c]	" " "	7.2	1/5	2/5
Control	" " "	7.0	1/5	2/5[b]

[a] Numerator = number of unparalyzed survivors; denominator = number of mice inoculated.

[b] 4/5 for 10^{-7}.

[c] Streptomycin-producing strain.

Results. The effect on MM virus, incorporated in agar, of growth of antiphage actinomycetes is recorded in table 1. The data reveal that only by *Actinomyces*[4] sp. 98 was the virus completely inactivated in the two dilutions tested. In view of the marked acidity produced in the medium, and the apparent acid-sensitivity of MM virus in certain buffer solutions (19), this result is of unknown significance. *Actinomyces* sp. 193–B, which produces the antiphage agent active in vitro against fowl pox virus (6), as well as a streptomycin-producing strain of *Actinomyces griseus*, did not demonstrably inactivate the MM strain.

[4] In the 6th edition of Bergey's *Manual of Determinative Bacteriology*, the genus *Actinomyces* has been changed to *Streptomyces*.

Of sixty untreated culture filtrates tested in vivo none was sufficiently active to justify further study, although activity of a very low order such as might be expected in such dilute solutions as culture filtrates may have been present.

Of 124 filtrates which were untreated or adjusted to pH 7.5 before being tested in vitro, only five preparations completely inactivated the dilutions of virus used in the original tests, and these results could not be confirmed with subsequent lots of culture filtrates from the same microorganisms. Loss of antibacterial properties among antibiotic-producing microorganisms is not uncommonly encountered. Variation of the parent cultures, for which actinomycetes are particularly notorious, may also have been a contributing factor.

These inconsistent results with MM virus are similar to the data reported by Jones and others (2) for the effects obtained with culture filtrates of a soil *Trichoderma* and *Actinomyces* on fowl pox virus. In studies on the inactivation of tobacco mosaic virus by bacteria and fungi, Johnson and Hoggan (4) obtained variable results. Schatz (unpublished data) found, that under the same experimental conditions, culture filtrates from different lots of the same antiphage actinomycetes fluctuated considerably in activity against certain bacterial viruses.

Culture filtrates of the streptomycin-producing strain of *A. griseus* were inactive against MM virus. Filtrates from this microorganism have already been shown to be inactive against vaccinia (3). Culture filtrates of the *Actinomyces* and *Trichoderma*, which Jones (2) reported to be effective in some tests against fowl pox, did not inactivate MM virus.

Despite the inactivity of 193–B by the agar-streak test (table 1) and the negative results obtained with culture filtrates, it was considered justifiable to test more completely the agent produced by this microorganism because it was active against fowl pox virus. For this purpose, antiphage fractions were prepared from the mycelium and culture filtrate by methods previously reported (6). At 1:80,000 and 1:50,000, on a dry-weight basis, these preparations caused a 100-fold reduction of *Staphylococcus aureus* phage K by the agar-tube technic (5) with overnight incubation at 37° C. When MM virus was exposed for 24 hours at room temperature to these antiphage preparations adjusted to pH 7.5, the culture filtrate fraction was inactive while only the undiluted mycelial extract inactivated the virus and this weakly (table 2). This activity is of the same order of magnitude as the effect of similarly prepared extracts on fowl pox virus (6). Tests with one lot of a mycelial preparation revealed that the undiluted material was markedly toxic to mice. Comparative studies with actinomycin, chaetomin, penicillin, and streptomycin revealed no activity against the virus. Actinomycin has been reported to be active against fowl pox and chick

laryngotracheitis (2), as well as influenza viruses (20). Chaetomin had never been tried against any virus. Although the inefficacy of penicillin and streptomycin against various viruses is well established, tests with these antibiotics had never been reported for the MM virus.

TABLE 2. *Effects in vitro of antibiotic agents on MM virus.*

Antibiotic	Experiment No.	$\frac{1}{2} \times 10^{-4}$ virus exposed to units per ml.[a]	Fate of mice inoculated with virus dilution[b]		
			24-hour exposure at room temperature		
			$\frac{1}{2} \times 10^{-4}$	$\frac{1}{2} \times 10^{-5}$	$\frac{1}{2} \times 10^{-6}$
Actinomycin	1	12,500	1/5	0/5	0/5
Antiphage agent (mycelial extract).[c]	1	1: 80,000[c]	.....	.....	.....
Undiluted	.....	.....	1/5	5/5	5/5
1: 2	.....	.....	2/5	1/5	2/5
1: 5	.....	.....	0/5	1/5	0/5
Antiphage agent[d] (from culture filtrate)	1	1: 50,000[d]	0/5	0/5	1/5
Chaetomin	2	500	0/5	0/5	1/5
Penicillin	2	20,000	0/5	0/5	1/5
Streptomycin	2	50,000	0/5	1/5	3/5
Broth salt control	1	.....	.....	0/5	0/5[e]
Broth salt control	2	.....	.....	0/5	2/5[e]

[a] $\frac{1}{2} \times 10^{-3}$ virus dilution employed with actinomycin.

[b] Numerator = number of unparalyzed survivors; denominator = number of mice inoculated.

[c] 26.4 mg. dry weight per ml. 1: 80,000 dilution on dry-weight basis caused 100-fold reduction in plaque count of *Staph. aureus* phage K by agar-tube technic with overnight exposure at 37° C.

[d] 22 mg. per ml. active at 1: 50,000. See footnote *c* above.

[e] 2/5 for $\frac{1}{2} \times 10^{-7}$.

In an attempt to obtain increased activity with *Actinomyces* sp. 193–B, variants were picked as individual, well-isolated plate colonies from 193–Or, the original parent 193 culture, and 193–W and 193–B, the white and brown strains derived from 193–Or. A total of 13 variants in addition to 193–Or, W, and B were selected for testing. These differed markedly in cultural properties (table 3) as well as in antiphage activity (table 4). The data in tables 3 and 4 indicate a correlation of lack of pigmentation in glucose-tryptone medium and absence of aerial mycelium with an acidic reaction and little or no antiphage properties. Conversely, browning of the culture medium and the presence of aerial growth appears more often than not to be associated with alkaline pH and higher antiphage activity.

These results are analogous to those obtained in studies of strain

TABLE 3. *Cultural characteristics of variants of Actinomyces sp. 193–B in tryptone-glucose medium.*

	11-day observations			
Variant[a]	Growth	Presence of of aerial mycelium	Brown pigmentation in medium	pH of culture filtrate
193–Or	++++	+	0	5.8
1	++++	0	0	5.2
2	++++	0	0	5.2
3	++++	0	++	5.1
193–W	++++	+	++++	7.5
4	++++	++	++++	8.0
5	++++	+++	++++	7.9
6	++++	++++	++++	8.0
7	++++	++++	++++	7.9
8	++++	++++	++++	7.8
9	++++	+++	++++	8.0
10	++++	0	++	5.3
193–B	++++	0	0	7.6
11	++++	++++	++++	7.8
12	++++	++++	++++	7.6
13	++++	++++	++++	7.9
Medium control				7.2

[a] Or = original 193 culture; W and B = white and brown strains derived from 193–Or. Variants 1–13 were isolated from Or, W, or B under which the numbers are listed.

specificity with *A. griseus* and *A. lavendulae* (21, 22). With *A. griseus* it was shown that at least for a group of variants obtained from a single parent culture, only those strains characterized by the formation of aerial mycelium and production of an alkaline reaction in the growth medium were able to elaborate streptomycin. Asporogenous, nocardia-like variants produced an acidic reaction and no streptomycin. A somewhat similar phenomenon was demonstrated for *A. lavendulae* and the antibiotic streptothricin.

In order to study as widely different strains of 193–Or as possible, 193–1, 193–8, 193–9, and 193–13 were selected because they varied markedly with respect to aerial mycelium, pigment production, reaction, and activity against bacteriophages. Glucose-tryptone culture filtrates of these variants were incubated with virus for one hour at room temperature. The results, which are not presented here, revealed no demonstrable reduction of infectivity. These strains, therefore, yielded culture filtrates without significant antiviral activity. Similar results had been obtained previously with glucose-tryptone culture filtrates from 193–Or, W, and B. No attempt was made to prepare and test extracts from the mycelium and filtrates of the variants.

TABLE 4. *Antiphage properties of variants of Actinomyces sp. 193–B grown in tryptone-glucose medium.*

Variant	11-day culture filtrates							
	Phage survival after exposure to filtrate dilution[a]							
	Staph. aureus phage K				*E. coli* phage T2			
	1:2	1:20	1:100	1:200	1:2	1:20	1:100	1:200
193–Or	AB	+	+	++++	+	++	+++	++++
1	0	+++	++++	.....	++++	.....	.....	.....
2	0	+++	++++	.....	++++	.....	.....	.....
3	0	++++	.....	.....	++++	.....	.....	.....
193–W	0	0	0	++	0	+	++	++++
4	AB	+	++++	.....	++++	.....	.....	.....
5	0	++	++++	.....	0	+	++	++++
6	0	++	++++	.....	0	+	+++	++++
7	0	+	++++	.....	+	+++	++++	.....
8	0	0	+	+[b]	0	+	++	++++
9	+	++	.....	.....	0	+	+++	++++
10	0	++++	.....	.....	++++	.....	.....	.....
193–B	0	+	++	++++	++	++++	.....	.....
11	0	+	+++	++++	+	+	++	++++
12	0	0	++++	.....	+	++	+++	++++
13	0	++	++++	.....	0	+	++	++++
Medium control	++++	.....	.....	.....	++++	.....	.....	.....

[a] AB = antibacterial; ++++ = normal plaque count; ++ = approximately a 10-fold reduction; + = about a 100-fold reduction; 0 = complete inactivation (no viable phage).
[b] ++++ at 1:1000.

SUMMARY

This report presents the results of a search for inhibitors of MM virus among soil actinomycetes antagonistic to bacterial viruses.

By an agar-streak technic, fourteen actinomycetes exhibited no antiviral activity which could not be attributed to the production of an unfavorable pH.

None of sixty culture filtrates tested in vivo was sufficiently active to justify further study. Five out of 107 filtrates tested in vitro were appreciably active in the original assays, but attempts to reproduce these results yielded less or no activity.

When undiluted, the antiphage agent extracted from the mycelium of *Actinomyces* sp. 193–B and shown in previous studies to be active against fowl pox virus was found to exert in vitro a slight effect against the virus. Under similar conditions, actinomycin, chaetomin, penicillin, and streptomycin were inactive.

Attempts to obtain increased activity from *Actinomyces* sp. 193–B by testing growth filtrates of variants which differed culturally and physio-

logically were unsuccessful. However, certain correlations between strain specificity and production of antiphage substances were observed.

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Literature Cited

1. **Linhares, H.** Substâncias antibióticas; ação dos filtrados de cogumelos e bactérias sôbre o virus amarilico de nectrotrópico. Rio de Janeiro. O Hospital **26**: 327–397. 1944.
2. **Jones, D., Beaudette, F. R., Geiger, W. B. & Waksman, S. A.** A search for virus-inactivating substances among microorganisms. Science **101**: 665–668. 1945.
3. **Ramon, G. & Richou, R.** Les complexes antagonistes des filtrats de *Penicillium notatum*, d'*Actinomyces griseus*, de *B. subtilis* et leur action in vitro sur le virus de la vaccine. Compt. Rend. Acad. Paris **224**: 1407–1410. 1947.
4. **Johnson, J. & Hoggan, I. A.** The inactivation of the ordinary tobacco-mosaic virus by microorganisms. Phytopathology **27**: 1014–1027. 1937.
5. **Jones, D. & Schatz, A.** Methods of study of antiphage agents produced by microorganisms. Jour. Bact. **52**: 327–335. 1946.
6. **Schatz, A. & Jones, D.** The production of antiphage agents by actinomycetes. Bull. Torrey Club **74**: 9–19. 1947.
7. **Katznelson, H.** Bacteriophage and the legume bacteria. Trans. 3rd. Comm. Int. Soc. Soil Sci. **A**: 43–48. 1939.
8. **Rakieten, M. L., Rakieten, T. L. & Doff, S.** The absorption of *Staphylococcus* bacteriophages. Jour. Bact. **32**: 505–518. 1936.
9. **Van Herick, W. & Eaton, M. D.** An unidentified pleuropneumonialike organism isolated during passages in chick embryos. Jour. Bact. **50**: 47–55. 1945.
10. **Evans, C. A.** [Personal communication, June, 1947.]
11. **Heilman, F. R. & Herrell, W. E.** Penicillin in the treatment of experimental ornithosis. Proc. Staff Meet. Mayo Clinic **19**: 57–65. 1944.
12. **Parker, R. F. & Diefendorf, H. W.** Effect of penicillin on certain viruses Proc. Soc. Exp. Biol. Med. **57**: 351–354. 1944.
13. **Meiklejohn, G., Wagner, J. C. & Beveridge, G. W.** Studies on the chemotherapy of viruses in the psittacosis-lymphogranuloma group. 1. Effect of penicillin and sulfadiazine in chick embryos. Jour. Immunol. **54**: 1–9. 1946.
14. **Wiseman, R. W., Meiklejohn, G., Lackman, D. B., Wagner, J. C. & Beveridge, G. W.** Studies on the chemotherapy of viruses in the psittacosis-lymphogranuloma group. 2. Effect of penicillin and sulfadiazine on seven strains in mice. Jour. Immunol. **54**: 9–16. 1946.
15. **Stoddard, E. M.** Inactivating *in vivo* the virus of X disease of peach by chemotherapy. Phytopathology **32**: 17. 1942. [Abstract.]
16. **Spizizen, J.** Some preliminary studies on the mechanism of virus multiplication. Proc. Nat. Acad. **29**: 109–114. 1943.

17. **Jungsblut, C. W., & Dallderf, G.** Epidemiological and experimental observations on the possible significance of rodents in a suburban epidemic of poliomyelitis. Am. Jour. Publ. Health **33:** 169–172. 1943.

18. **Johnson, J.** Chemical inactivation and the reactivation of a plant virus. Phytopathology **31:** 679–701. 1941.

19. **Schatz, A., & Plager, H.** The effect of pH on MM virus. [To be published.]

20. **Robinson, H. J.** Some toxicological, bacteriological, and pharmacological properties of antimicrobial agents produced by soil micro-organisms. Thesis. Rutgers University, 46p. 1943.

21. **Schatz, A. & Waksman, S. A.** Strain specificity and production on antibiotic substances. 4. Variations among actinomycetes with special reference to *Actinomyces griseus.* Proc. Nat. Acad. **31:** 129–137. 1945.

22. **Waksman, S. A. & Schatz, A.** Strain specificity and production of antibiotic substances. 6. Strain variation and production of streptothricin by *Actinomyces lavendulae.* Proc. Nat. Acad. **31:** 208–214. 1945.

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FERNS AND FLOWERING PLANTS OF BEAVER ISLAND, LAKE SUPERIOR, MINNESOTA

OLGA LAKELA

Introduction. The study of Beaver Island was undertaken for the enjoyment of collecting and knowing its flora. It is an inviting island of jagged rocks with a well developed vegetation cover. The island is privately owned but it has never been inhabited. The simple cabin in the shelter of the trees and the improved rock-landing for pleasure trips are the only traces of human activity.

In studying the flora, altogether seven collecting trips were made between the years of 1944 and 1947. An attempt was made to cover the area at intervals during the growing season. Therefore, one trip was made each May, June, July, and September, and three in August. To gain knowledge on winter conditions, a single trip was made in early March of 1945, when a severe freezing of the lake made crossing by ice possible. However, one could only view the ice-covered shore from the lake ice. Deep snow made climbing impossible.

Since it was not possible to land on the island during high wave action, the collecting trips were conditioned by the weather and the schedule of the busy fishermen who serviced motor boats. The writer is grateful to the following companions who at different times shared the pleasure of collecting and assisted especially in making nesting records of bird life: Miss Mary I. Elwell, Miss Evelyn Jones, Mrs. Arthur Roberts and son Henry, Mrs. Richard Northrup, all of Duluth, and Dr. Ethel Sue Horton, St. Olaf College, Northfield, Minnesota.

Location and Description. Beaver Island in Lake Superior is situated at 47½° N latitude, and 91¼° W longitude. Four acres in area, it is the largest of the five islands between East Beaver Bay and the Palisade Head, Lake Co. About 1250 ft. from the shore directly across from the White Rock Resort, its elevation rises to some 50 ft. above the lake level. The island, elliptical in outline, the longer axis of some 1100 ft., twice the length of the shorter, parallels the lake shore.

The rock mass is white, containing anorthosite largely, and dark diabase, similar in color and texture to the shore rocks and the outcrops of white rock on the high range of hills northwest.

In contour the chief rock mass appears to be a continuous fold broken into ledges and cliffs about the shores, forming a number of rock pools near

the lake level, and at least two permanent pools near the summit level. The southwest end of the island consists of two points with a cleft between them extending down to the lake level. Lakeward the rocks slope at an angle of about 45°. They are bare to the summit level except in sheltered clefts and niches. A part of the side facing land is a vertical cliff with lichen mats inaccessible to the collector.

Faunistic Aspects. The chief faunistic attraction on the island is the herring gull, *Larus argentatus smithsonianus,* nesting in a colony. The bulky nests of coarse vegetation are constructed mostly on exposed ledges, some time in April. Each nest usually has three eggs. The population count of the colony on May 26, 1945, established a record of 160 nests containing 327 eggs altogether, and 30 young, a few days old. During various trips the red-breasted merganser, *Mergus serrator,* has been observed swimming or in flight around the island. On June 22, 1946, three nests within bushy arbor-vitae were located, containing nine, eight and seven eggs respectively.

The island may serve as a resting spot for migrating birds. Shore birds, sparrows, and warblers have been observed there. The fruits of the mountain ash, remaining on the trees through the winter and the spring until the new growth of buds, attracts flocks of robins and cedar waxwings.

In the rock pools tadpoles have been observed during the summer trips. The adult frog collected was determined as *Rana sylvatica* var. *cantabrigensis.* No attempt was made to collect insects. The presence of species of mice was not noted before 1947, during the last trip, but no collections were made. It is the only mammal observed.

Vegetation. The shallow soil on the rocks supports a birch-conifer forest with an undergrowth of shrubs and herbs typical of the area. The stand of *Pinus Strobus* constitutes one-third of the sizable conifers which include *Picea glauca, P. mariana, Abies balsamea,* and *Thuja occidentalis.* The last named species is largely represented as young bushy crevice trees. The chief deciduous trees are *Betula papyrifera, B. cordata,* and *Sorbus subvestita.* A thicket of young *Populus deltoides* occurs on high rocks in the grassy border of the tree cover.

The shrub stratum dominated by *Alnus crispa* is well developed under the trees. Associated taller shrubs are *Cornus stolonifera, C. Baileyi, Amelanchier sanguinea,* and *Sambucus pubens.* In the more exposed situations of the rock clefts occur *Rosa acicularis, Diervilla Lonicera, Spiraea alba, Rubus strigosus,* and three species of *Ribes.* The chief shrubby components of the heath mat in crevices, on ledges are species of *Vaccinium, Arctostaphylos; Ledum groenlandicum, Chamaedaphne calyculata, Potentilla fruticosa,* and *Salix Bebbiana* grow in rock clefts about the pools and shoreline.

The herb stratum under shrubs is dominated by *Lycopodium annotinum; Cornus canadensis* and *Viola incognita* are well represented in shady situa-

tions, where also occur large clumps of *Dryopteris spinulosa*, and colonies of *Lycopodium obscurum* var. *dendroideum*. On top ledges in deep lichen mats occur *Lycopodium Selago*, rarely encountered in the state, and its more common var. *patens*.

The principal herbs in full flower in the vernal aspect as observed on May 26, 1945, were the two species of *Primula*, *Pinguicula vulgaris*, *Coptis groenlandica*, and *Saxifraga virginiensis*.

Distribution and Noteworthy Species. The clear-cut pattern of the whole flora, as studied by intensive collecting is traceable to its sources in the flora of the nearby mainland. The disseminules of the established flora may be carried by winds, waves, and lake currents or by birds. Ten of the twelve species of composites have wind-borne fruits; the grasses and sedges are probably water-borne, reaching the clefts on highest rocks by the pounding surf which hurls spray high against the sloping cliffs. However, at least three different entities cannot be matched in the flora of the nearby mainland: *Carex deflexa*,[1] only recently collected in Minnesota, and *Campanula rotundifolia* var. *intercedens* f. *cleistocodona*,[2] the sterile clone filling a single rock fissure on the island. Noteworthy is also the typical variety of *Lycopodium Selago*, the second known locality in the state.

POLYPODIUM VIRGINIANUM L. *5761*, a small colony on a shady ledge, southwest end of the island.

ATHYRIUM ANGUSTUM (Willd.) Presl. *5706*, *5759*, in rock clefts west side of the island.

DRYOPTERIS DISJUNCTA (Rupr. ex Schur.) Morton. *5756*, common on shady ledges and in crevices; *6195* approaches *D. Robertiana* in leaf form, but lacks glandulosity.

DRYOPTERIS PHEGOPTERIS (L.) C. Chr. *5757*, less abundant than the preceding species.

DRYOPTERIS FRAGRANS (L.) Schott. var. *remotiuscula* Komarov. No coll., rare in fissures of an inaccessible shore cliff.

DRYOPTERIS SPINULOSA (O. F. Mueller) Watt. *5758*; *6070*; *6196*, large luxuriantly growing plants under the tree cover.

CYSTOPTERIS FRAGILIS (L.) Bernh. *7569*, sparingly represented in fissures southwest end.

WOODSIA ILVENSIS (L.) R. Br. *5760*, common in exposed situations.

OSMUNDA CLAYTONIANA L. *5720*, a sterile leaf collected from a plant in moss border of rock pool, near the summit.

OSMUNDA CINNAMOMEA L. *5744*, a sterile leaf from a plant on low rock ledge east side of the island.

LYCOPODIUM SELAGO L. *6063*, typical form growing in lichen mats on the top-most ledge, near the center of the island.

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[1] **Lakela, Olga.** Rhodora **43**: 154–156. 1941. Notes on the flora of Minnesota with new records and extensions of ranges.

[2] **Lakela, Olga.** Rhodora **47**: 391–392. 1945. A new form of *Campanula* from Minnesota.

LYCOPODIUM SELAGO var. PATENS (Beauv.) Desv. *5776*, growing with the typical form and also on lower ledges, being more common.

LYCOPODIUM ANNOTINUM L. *5781*, *6061*, the dominant plant in the ground cover under trees and shrubs.

LYCOPODIUM CLAVATUM L. *6187*, uncommon growing with the preceding species.

LYCOPODIUM OBSCURUM L. var. DENDROIDEUM (Michx.) D. C. Eaton. *5779*, fairly abundant.

LYCOPODIUM COMPLANATUM L. var. ELONGATUM Vict. *6077*, a few plants only.

PINUS STROBUS L. *5938*, large trees conspicuous in the stand of conifers, the only species of pine on the island. One tree was badly infected with ripe aecia of *Cronartium ribicola*. Rust spots were observed on leaves of *Ribes glandulosum*.

PICEA GLAUCA (Moench) Voss, represented by large trees of two color phases, *5939* from a tree with greenish aspect; *5941* from one with bluish aspect, as observed in late May. The color difference is less pronounced in later summer and fall, almost indiscernible.

PICEA MARIANA (Mill.) B.S.P. *5940*, small trees only and less common than the preceding species.

ABIES BALSAMEA (L.) Mill. *5949*, vigorously growing young trees.

THUJA OCCIDENTALIS L. *5745*, some large trees but mostly young bushy forms in exposed clefts, and ledges.

AGROSTIS SCABRA Willd. *5715*, in moist moss mats about rock pools and shores.

CALAMOGROSTIS CANADENSIS L. *5734*, *6058*, the most abundant grass in shady and exposed situations.

CALOMOGROSTIS INEXPANSA A. Gray. *5719*, *6073*, in exposed crevices of the highest rocks; appears stout and stiff.

DANTHONIA SPICATA (L.) Beauv. *5786*, in dry lichen mats crest of ledges.

DESCHAMPSIA CAESPITOSA (L.) Beauv. *5750*, common in seams of shore rocks.

FESTUCA SAXIMONTANA Rydb. *6082*, in lichen mats under pine trees.

POA COMPRESSA L. *6358*, common in rock seams.

POA GLAUCA Vahl. *5703*, in crevices of high rocks.

POA INTERIOR Rydb. *6078*, growing generally about the shrub border.

POA PALUSTRIS L. *5704*, in moist moss mats about rock pools.

POA PRATENSIS L. *7078*, in moss mat front of the cabin.

TRISETUM SPICATUM (L.) Richter. *5716*, occasional in vegetation mats of high rocks.

SCIRPUS CAESPITOSUS L. *5721*, well established in crevices of shore rocks.

SCIRPUS CYPERINUS (L.) Kunth. var. PELIUS Fern. *5739*, only a few plants on shores of rock pools.

CAREX CRAWFORDII Fern. *6053*, one plant in moist moss mat.

CAREX CANESCENS L. *6055*, rare, under shrubs.

CAREX BRUNNESCENS (Pers.) Poir. *6054*, rare, under shrubs.

CAREX DISPERMA Dewey. *5738*, in moist hollow under pine trees.

CAREX LENTICULARIS Michx. *5737*, moss border of rock pools.

CAREX TONSA (Fern.) Bicknell. *6093*, a few plants in post mature condition from grass mats along the shrub border.

CAREX UMBELLATA Schkuhr. *6353*, in dry lichen mats under pines.

CAREX DEFLEXA Hornem. *6318*, in lichen and moss mats, rocky top, border of shrubs.

JUNCUS BREVICAUDATUS (Engelm.) Fern. *5789*, in moist moss mats, on a ledge near top level.

CLINTONIA BOREALIS (Ait.) Raf. *5762*, sparingly represented; under pines.

MAIANTHEMUM CANADENSE Desf. *5773*, with preceding species; more common.

SALIX BEBBIANA Sarg. *5942*, poorly growing shrubs in rock clefts.

POPULUS TREMULOIDES Michx. *6352*, a thicket of young trees in a grassy opening, southwest end of the island.

BETULA PAPYRIFERA Marsh. *5778*, many large trees.

BETULA CORDIFOLIA Regel. *6351*, large trees; less common than the preceding species.

ALNUS CRISPA (Ait.) Pursh. *5713*, the chief shrub in the undergrowth.

RUMEX MEXICANUS Meisn. *5748*, a few plants on a low ledge west side.

POLYGONUM LAPATHIFOLIUM L. *5746*, northeast side on top rocks.

POLYGONUM CONVOLVULUS L. *7270*, a single plant in grass mat, southeast side.

POLYGONUM CILINODE Michx. *5747*, among shrubs on top ledges.

CHENOPODIUM LEPTOPHYLLUM Nutt. *6181*, in moist grass mats.

STELLARIA LONGIFOLIA Muhl. *6052*, matted colonies on exposed ledges.

THALICTRUM sp. No coll., a single flowerless plant in crevice of steep cliff.

COPTIS GROENLANDICA (Oeder) Fern. *5809*, in sphagnum border of a rock pool near the summit.

ACTAEA RUBRA (Ait.) Willd. *6191*, a few plants among grasses under conifers, southwest end.

CORYDALIS SEMPERVIRENS (L.) Pers. *6051*, in moss mats of exposed ledges.

RIBES GLANDULOSUM Weber. *5926*, frequent in crevices along the shrub border.

RIBES OXYCANTHOIDES L. *5809*, with the preceding species; less abundant.

RIBES TRISTE Pall. *5297*, in shady situations under shrubs.

SAXIFRAGA VIRGINIENSIS Michx. *5929*, in the vernal aspect dominates the moss mats on southeast-facing ledges by vigorous growth of flowers; toward later summer scarcely discernible.

SPIRAEA ALBA Du Roi. *5741*, frequent, in rock clefts.

SORBUS SUBVESTITA Greene. *5714*, large trees.

AMELANCHIER SANGUINEA (Pursh) D.C. *5785*, a few shrubs with diseased foliage and fruit.

POTENTILLA FRUTICOSA L. *5705*, common on shore ledges.

POTENTILLA MONSPELIENSIS L. *5841*, on exposed rocks.

POTENTILLA TRIDENTATA Ait. *5847*, common in rock seams.

RUBUS PUBESCENS Raf. *5928*, a few plants under shrubs.

RUBUS STRIGOSUS Michx. *5728*, common on southeast side.

ROSA ACICULARIS Lindl. *5742*, common in the shrub border, east side.

VIOLA ADUNCA J. E. Smith. *5925*, in crevices of southeast-facing rocks.

VIOLA INCOGNITA Brainard. *5783*, in moist hollow under pine trees.

EPILOBIUM ANGUSTIFOLIUM L. *5768*, common in the shrub border.

EPILOBIUM ADENOCAULON Haussk. *5770*, on shore ledges.

ARALIA HISPIDA Vent. *5763*, in moss mats of exposed ledges.

ARALIA NUDICAULIS L. *5764*, in shady situations.

CARUM CARVI L. *6193*, a single rosette not in bloom near the boat landing.

CORNUS CANADENSIS L. *5754*, growing generally under the tree cover.

CORNUS BAILEYI Coulter & Evans. *6076*, well growing shrubs on high rocks.

CORNUS STOLONIFERA Michx. *5755*, more common than the preceding species.

PYROLA ELLIPTICA Nutt. *5775*, a few plants under pines.

PYROLA SECUNDA L. *5774*, a few plants with the preceding species.

ARCTOSTAPHYLOS UVA-URSI Spreng. *6185*, on high ledges, southeast-facing rocks.

ARCTOSTAPHYLOS UVA-URSI var. COACTILIS Fern. & MacBride. *6084*, with the preceding species.

CHAMAEDAPHNE CALYCULATA (L.) Moench. *5742*, in clefts of shore rocks.

LEDUM GROENLANDICUM Oeder. *5933*, with the preceding species.

VACCINIUM CANADENSE Kalm ex Richards. *6218*, on high ledges in the shrub border.

VACCINIUM PENNSYLVANICUM Lam. *6184*, with the preceding species.

VACCINIUM PENNSYLVANICUM var. MYRTILLOIDES (Michx.) Fern. *6219*, with the typical form.

PRIMULA INTERCEDENS Fern. *5931; 5767, 6066*, in moss border of rock pool.

PRIMULA MISTASSINICA Michx. *5932; 6065, 6090*, with the preceding species and vegetation mats about shore pools.

TRIENTALIS AMERICANA (Pers.) Pursh. *5772; 5944*, in *Sphagnum* border of rock pool.

EUPHRASIA HUDSONIANA Fern. et Wieg. *5732*, on low shore ledge west side.

PINGUICULA VULGARIS L. *5731, 5711*, in *Scirpus* mats around rock pools.

GALIUM TRIFLORUM L. *5782*, a few plants among grasses under shrubs.

DIERVILLA LONICERA Mill. *5719*, a few shrubs on southeast-facing rocks.

SAMBUCUS PUBENS Michx. *5787*, a few shrubs in exposed situations.

LINNAEA BOREALIS L. var. AMERICANA (Forbes) Rehder. *5766*, sparingly growing in lichen mats and sphagnum border of pools.

CAMPANULA ROTUNDIFOLIA L. var. INTERCEDENS (Witasek) Farw. *6092*, common in crevices under all exposures.

CAMPANULA ROTUNDIFOLIA var. INTERCEDENS f. CLEISTOCODONA Lakela. *5777*, in a single rock fissure, southeast end of the island.

SOLIDAGO JUNCEUS Ait. *6180*, in grass mats under shrubs.

SOLIDAGO HISPIDA Muhl. *5707*, on exposed ledges.

SOLIDAGO ULIGINOSA Nutt. *5840*, about rock pools.

ASTER CILIOLATUS Lindl. ex Hooker. *6178*, along the shrub border.

ASTER MACROPHYLLUS L. *6179*, with the preceding species.

ASTER UMBELLATUS Mill. var. PUBENS Gray. *5740*, among shrubs.

ACHILLEA LANULOSA Nutt. *5771*, on exposed ledges.

MATRICARIA SUAVEOLENS (Pursh) Buchen. *5749*, low shore ledge on west side.

PETASITES PALMATUS (Ait.) Gray. *6081*, sterile plants under pines.

TARAXACUM PALUSTRIS (Lyon) Lam. var. VULGARE (Lam.) Fern. *6192*, on high ledge.

LACTUCA sp. A single rosette, a leaf collected, *6194*, not determined.

HIERACIUM CANADENSE Michx. *5765*, common in vegetation mats, east side.

SUMMARY

The plant population of the four-acre island constitutes 117 species of ferns and flowering plants. Ferns and lycopods together include 16 species; the conifers, the dominant tree type, 5 species; the monocots, 25 species having the largest representation by grasses and sedges, 12 and 10 species respectively; of the dicots (71 species), *Rosaceae* and *Compositae* are best established, including 10 and 12 species respectively.

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ADDITIONAL PLANTS OF EL SALVADOR

MARGERY C. CARLSON

About 1000 species of plants, representing 123 families, were collected in El Salvador between January 10 and March 10, 1946, for the herbarium of the Chicago Natural History Museum. Dr. Paul C. Standley, Curator of the Museum, visited El Salvador between December 20, 1921, and May 7, 1922, and with Salvador Calderón made the collections which were reported in their "Lista Preliminar" (2). Since then, brief articles have been published by Anton Kovar (1), and by J. M. Tucker and C. H. Muller (3). The present account deals with some species not previously reported for El Salvador by these authors. The identifications were made by Dr. Paul C. Standley and Dr. Julian Steyermark.

El Salvador is a small country (13,000 sq. mi.) lying southeast of Guatemala and south of Honduras. It is densly populated (about 2,000,000) and extensively cultivated; hence the areas where natural vegetation can be found are limited to places where cultivation is not possible, such as roadside hedges, river valleys, and the tops of the volcanoes and mountains.

The long axis of the country lies almost east and west. An irregular range of volcanic mountains extends across the country, parallel to the coast, and higher mountains lie on the Honduran and Guatemalan boundaries. The plateau between these ranges is very mountainous. The eastern part is lower and more level and is hotter and dryer than the rest of the country. One large river, the Lempa, traverses the country in a sweeping S-shaped curve.

The year is divided about equally between the rainy and the dry seasons, the rainy season occurring between May and October, the dry season between November and April. About 80 inches of rain fall per year. The collections reported here were made in the dry season, and the only moist places visited were the shores of lakes and the tops of the mountains where clouds rest much of the time.

The accompanying map shows the departments, the principal towns and roads, the larger lakes and the Lempa River. The places where collections were made are marked with arabic numbers, and are briefly described below.

I. Department of San Salvador, vicinity of the capitol, San Salvador.

1. San Marcos, a neighboring village to the s.e. Alt. 2600 ft.[1] Narrow road with high almost perpendicular moist banks, up a steep hill and then along paths through a coffee plantation to the summit. January 10.

[1] The elevations were determined with an altimeter and are probably accurate within 200 feet.

2. Los Planes, s. of San Salvador. Alt. 3500 ft. Vicinity of Balboa Park in the untended grassy areas under trees many of which were planted, and along steep roadside embankments. January 11.
3. Banks of the river Acelhuate s.e. of the capitol. 2300 ft. Along river, bordered by steep slopes with dense tangle of shrubs and vines part of the distance, and by grassy meadows in other places. January 13.
4. Cerro Chulo, beyond Los Planes. Highest hill s. of San Salvador. Alt. 4000 ft. A small patch of native vegetation on the s.e. slope just below its summit, somewhat disturbed by cattle. The peak is rocky and windswept. January 28.
5. Volcano of San Salvador. From Finca Florencia to south rim of crater. Alt. 6200 ft. Trail up a steep grassy slope, through coffee plantation for a little way to a main road, which ends at a park and from which narrow trails lead off in both directions along the rim of the crater. January 30.

6. Crater of the Volcano of San Salvador. Along trails on steep, rocky, sparsely wooded slopes inside the crater and on its grassy floor. Alt. of floor, 4700 ft. February 2.
7. Volcano of San Salvador. Road from Finca Florencia to base of peak on its west side, then up through coffee plantation to a very dense forest on the steep slope. Alt. 6300 ft. Forest dark and damp, soil loose, much leaf mould. Trees, mostly oaks, covered with epiphytes. January 31.
8. Same as 7, but from Finca Las Brumas along trail, which is on s.w. side, to peak. Alt. 6700 ft. This side has been cleared and has many cultivated fields almost to the top. The oak forest described in 7 extends to the top. The slopes are precipitous. February 3.

II. Department of La Libertad.

9. Finca El Paraiso, on n. slope of mountain, one-fourth mile s. of Santa Tecla. Alt. 3200 ft. Paths through the coffee plantation, with several undisturbed gorges; along a grassy road on the ridge (alt. 3800 ft.) and along a road to the south toward Manzano. January 14.
10. Finca Los Naranjos, one-half hour by truck s.w. from Santa Tecla. Alt. 3900 ft. Road through coffee plantation to a stream and then along the small canyon of the stream with dense and rank vegetation (tree-ferns, aroids, etc.). January 16.
11. Finca Santa María, w. of Santa Tecla, near Colon, and the valley of the river

Colon. Alt. 2500 ft. River valley 50 to 75 feet wide, banks steep and high; stream shallow and swift; stream-bed rocky. January 19.

12. Finca Germania, near Comasagua, on mountain range, called La Cumbre, parallel to coast and about 10 miles inland. Alt. 3000 ft. Trails through coffee plantation, along streams and on hillsides. January 22.

13. Road between Finca Germania and Finca San Antonio, La Cumbre. Alt. 3000 ft. January 23.

14. Hacienda Cuyagualo, south of Lago Zapotitlan, along the river Gualo. Alt. 1000 ft. A wide, flat, dry valley, most of which was planted with corn and cotton. January 27.

15. La Libertad. West along dry stream-bed through Finca Santa Emilia and back along coast. Sea level. February 11.

III. Department of Sonsonate.

16. Road to Sonsonate and village of Nahulingo. Alt. 900 ft. February 21.

IV. Departments of San Vicente, Usulutan, and La Union.

17. Pan American highway to San Vicente. Alt. 2000 ft. February 14.

18. San Vicente to La Union. Alt. diminishing to sea level. Stops were made in the dry flats along the Lempa River, in Santiago de María, at Finca San Jaime and La Union. All of this part of the country was extremely dry, and not many species were found in bloom. February 15.

V. Department of Santa Ana.

19. Volcano of Santa Ana. Alt. 7800 ft. Trail passed through open areas with low shrubby growth, pine forest, and dark, damp cloud forest to open area at the top near the rim of the crater. February 19.

20. Hacienda San Miguel, above Metapán. Alt. 2600 ft. Trail to Cerro El Pinal, alt. 4600 ft., through oak and pine forest; along the San Miguel River. February 22.

21. Hacienda San José (alt. 5400 ft.) to Hacienda Los Planes (alt. 8300 ft.) Steep rough trail through oak and pine forests, mountains n.e. of Metapan. February 24.

22. Cerro Miramundo, above Hacienda Los Planes. Alt. 8000 ft. Trail leads first through a cleared area covered with shrubby growth. The cloud forest begins at 7300 ft. On the peak we came out of the forest into an area of low stiff shrubs. February 25.

23. Hacienda La Barra. Alt. 1400 ft. The north shore of Lago Güija, on a long point of land which extends out into the lake and lies on the Guatemalan boundary. Land flat, inundated during the rainy season; groves of enormous trees whose trunks stand 4–5 feet deep in water when land is inundated. February 27.

24. Metapán. Alt. 1400 ft. Streets and gardens in town. February 26.

VI. Department of Chalatenango.

25. Road between San Salvador and La Palma. Alt. 2300 ft. to 3000 ft. North of crossing of Lempa River, Semi-desert, flat. February 12.

26. Same as 25, but higher in the mountains and nearer the Honduran boundary. First stop in mixed forest—oak, liquidambar, pine. Second stop still higher in pure pine forest. February 12.

VII. Department of La Paz.

27. Hacienda Santa Thomas. Southeast from Sal Salvador, near coast. Alt. 150 ft. Through forest of flood plain to Pacific beach. February 6, 7.

VIII. Copan, Honduras.

28. Vicinity of the ruins of Copan. Alt. 2000 ft. Above a river valley. February 10.

The plants are listed below by families and the families are arranged as by Standley and Calderon (2). Most of the plants which are generally dis-

tributed in tropical regions are omitted. One new species (*Salvia Carlsonae* Standl. & Steyerm.) is listed, but this plant has not yet been described.

Typhaceae

TYPHA TRUXILLENSIS HBK. *265*. Sonsonate, alt. 900′. Feb. 21.

Gramineae

ARTHROSTYLIDIUM RACEMIFLORUM Steud. *1006*. Cerro Miramundo, alt. 8700′. Feb. 25.

Cyperaceae

CAREX DONNELL–SMITHII L. H. Bailey. *911*. Cerro Miramundo, alt. 8700′. Feb. 25.

Araceae

ANTHURIUM SUBCORDATUM Schott. *940*. Cerro Miramundo, alt. 8700′. Feb. 25.

Lemnaceae

LEMNA MINOR L. *1045*. Metapán, alt. 1400′. Feb. 26.

Bromeliaceae

TILLANDSIA LEIBOLDIANA Schlecht. *732*. Volcano San Salvador. Jan. 30.

Commelinaceae

COMMELINA ERECTA L., *47*. San Salvador, alt. 2300′. Jan. 13; *654*. San Vicente, alt. 2000′. Feb. 14.

Liliaceae

SMILAX JALAPENSIS Schlecht. *719*. Volcano Santa Ana, alt. 7800′. Feb. 19.
SMILACINA FLEXUOSA Bertol. *717*. Volcano Santa Ana, alt. 7800′. Feb. 19.
SMILACINA PANICULATA Mart. & Gal. *713*. Volcano Santa Ana, alt. 7800′. Feb. 19; 901. Cerro Miramundo, alt. 8700′. Feb. 25.

Musaceae

HELICONIA COLLINSIANA Griggs. *162*. Rio Colón, alt. 2500′. Jan. 19.

Piperaceae

PEPEROMIA COLLOCATA Trelease. *483*. Volcano San Salvador, alt. 6700′. Feb. 3; *976*. Cerro Miramundo, alt. 8700′. Feb. 25.
PEPEROMIA GALLIOIDES HBK. *233*.Finca San Antonio, alt. 3000′. Jan. 23; 474. Volcano San Salvador, alt. 6300′. Jan. 31; *718*. Volcano Santa Ana, alt. 7800′. Feb. 19.
PEPEROMIA OBTUSIFOLIA (L.) A. Dietr. *484*. Volcano San Salvador, alt. 6700′. Feb. 3; *915*. Cerro Miramundo, alt. 8700′. Feb. 25.
PEPEROMIA QUADRIFOLIA (L.) HBK. *113*. Finca Paraiso, alt. 3200′. Jan. 14; *266*. Finca Germania, alt. 3000′. Jan. 22; *889, 938*. Cerro Miramundo, alt. 8700′. Feb. 25.
PEPEROMIA REFLEXA (L.f.) A. Dietr. *937*. Cerro Miramundo, alt. 8700′. Feb. 25.
PIPER AMALAGO L. *320*. Cerro Chulo, alt. 4000′. Jan. 28.
PIPER SUBCITRIFOLIUM C. DC. *139*. Finca Los Naranjos, alt. 3900′. Jan. 16.

Myricaceae

MYRICA CERIFERA L. *591.* Pa Palma, alt. 5000′. Feb. 12; *736.* Volcano Santa Ana, alt. 7800′. Feb. 19; *756.* Hacienda San Miguel, alt. 2600′. Feb. 22; *960.* Cerro Miramundo, alt. 8700′. Feb. 25.

Betulaceae

ALNUS ARGUTA (Schlecht.) Spach. *710.* Volcano Santa Ana, alt. 7800′. Jan. 30.

Moraceae

BROSIMUM ALICASTRUM L. *518.* Copán, Honduras, alt. 2000′. Feb. 10.
CECROPIA OBTUSIFOLIA Bertol. *179,* Colón, alt. 2500′. Jan. 19.
FICUS COTINIFOLIA HBK. *954.* Cerro Miramundo, alt. 8700′. Feb. 25.
FICUS INAMOENA Standl. *526.* Copán, Honduras, alt. 2000′. Feb. 10.

Proteaceae

ROUPALA BOREALIS Hemsl. *462.* Volcano San Salvador, alt. 6700′. Feb. 3.

Loranthaceae

PHORADENDRON CRISPUM Trelease. *881.* Cerro Miramundo, alt. 8700′. Feb. 25.
STRUTHANTHUS DENSIFLORUS (Benth.) Standl. *213.* Finca Germania, alt. 3000′. Jan. 22.

Polygonaceae

POLYGONUM MEXICANUM Small. *1019.* La Barra, alt. 1400′. Feb. 27.
TRIPLARIS MELAENODENDRON (Bertol.) Standl. & Steyerm. *560.* San Salvador, alt. 2300′. Feb. 8.

Basellaceae

BOUSSINGAULTIA RAMOSA (Moq.) Hemsl. *188.* Sonsonate, alt. 900′. Feb. 21.

Caryophyllaceae

STELLARIA CUSPIDATA Willd. *695.* Volcano Santa Ana, alt. 7800′. Feb. 19.

Menispermaceae

TRIPODANDRA CUMANENSIS (Kunth) Woodson. *50.* San Salvador, alt. 2300′. Jan. 13.

Annonaceae

CANANGA ODORATA (Lam.) Hook. & Thoms. *285, 1150.* Finca Paraiso, alt. 3200′. Feb. 14.

Lauraceae

PHOEBE MEXICANA Meissn. *408.* Volcano San Salvador, alt. 6300′. Jan. 31.

Hamamelidaceae

LIQUIDAMBAR STYRACIFLUA L. *608.* La Palma, alt. 5000′. Feb. 12; *757,* Hacienda San Miguel, alt. 2600′. Feb. 22.

Rosaceae

RUBUS ADENOTRICHOS Schlecht. *381.* Finca Florencia, alt. 6200′. Jan. 30.
RUBUS MACROGONGYLUS Focke. *697.* Volcano Santa Ana, alt. 7800′. Feb. 19.
RUBUS ROSAEFOLIUS J. E. Smith. *499.* Finca Florencia, alt. 6300′. Jan. 30.

Leguminosae

ACACIA SPADICIGERA Schl. & Cham. *55*. San Salvador, alt. 2300′. Jan. 13; *293*. Cuyagualo, alt. 1000′. Jan. 27.
CAESALPINIA CONZATTII (Rose) Standl. *561*. La Libertad, sea level. Feb. 11.
CAJANUS DISCOLOR DC. *19*. San Marcos, alt. 2600′. Jan. 10.
CASSIA INDECORA HBK. *217*. Finca Germania, alt. 3000′. Jan. 22.
CASSIA GUATEMALENSIS Donn. Smith. *949a*. Cerro Miramundo, alt. 8700′. Feb. 25.
CROTALARIA MUCRONATA Desv. *69*. Finca, Paraiso, alt. 3200′. Jan. 14.
DALBERGIA GLABRA (Mill.) Standl. *564*. La Libertad, alt. sea level. Feb. 11.
DALEA VULNERARIA Oerst. *788*. Hacienda San Miguel, alt. 2600′. Feb. 22.
DIPHYSA FLORIBUNDA Peyr. *439*. Crater, Volcano San Salvador, alt. 4700′. Feb. 2; *949*. Cerro Miramundo, alt. 8700′. Feb. 25.
DESMODIUM NICARAGUENSE Benth. *267*. Finca Germania, alt. 3000′. Jan. 22.
DESMODIUM SCORPIURUS (Sw.) Desv. *301*. Hacienda Cuyagualo, alt. 1000′ Jan. 27.
ERYTHRINA BERTEROANA Urban. *93*. Finca Paraiso, alt. 3200′. Jan. 14.
ERYTHRINA MACROPHYLLA DC. *420*. Volcano San Salvador, alt. 6300′. Jan. 31.
GLIRICIDIA GUATEMALENSIS Micheli. *758*. Hacienda San Miguel, alt. 2600′. Feb. 22.
INGA MICHELIANA Harms. *206*. Finca Germania, alt. 3000′. Jan. 22.

Geraniaceae

GERANIUM GUATEMALENSE Knuth. *358*. Finca Florencia, alt. 6200′. Feb. 2; *696*. Volcano Santa Ana, alt. 7800′. Feb. 19.

Euphorbiaceae

CNIDOSCOLUS ACONITIFOLIUS (Mill.) I. M. Johnston. *535*. Copán, Honduras, alt. 2000′. Feb. 10.
CNIDOSCOLUS TUBULOSUS (M. Arg.) I. M. Johnston. *782*. San Miguel, alt. 2600′. Feb. 22.
CROTON GUATEMALENSIS Lotsy. *205*. Finca Germania, alt. 3000′. Jan. 22.
EUPHORBIA SCABRELLA Boiss. *244*. Finca San Antonio, alt. 3000′. Jan. 23; *699*. Volcano Santa Ana, alt. 7800′. Feb. 19.

Aquifoliaceae

ILEX TOLUCANA Hemsl. *463*. Volcano San Salvador, alt. 6300′. Feb. 3.

Celastraceae

CELASTRUS VULCANICOLA Donn. Smith. *900*. Cerro Miramundo, alt. 8700′. Feb. 27.
ZINOWIEWIA RUBRA Lundell. *689*. Volcano Santa Ana, alt. 7800′. Feb. 19.

Rhamnaceae

RHAMNUS CAPREAEFOLIA Benth. *476*. Volcano San Salvador, alt. 6300′. Feb. 3.

Vitaceae

CISSUS MARTINIANA Woodson & Seibert. *918*. Cerro Miramundo, alt. 8700′. Feb. 25.

Tiliaceae

TRIUMFETTA DUMETORUM Schlecht. *723*. Volcano Santa Ana, alt. 7800′. Feb. 19.

Sterculiaceae

HELICTERES MEXICANA HBK. *857*. Hacienda San José, alt. 5400′. Feb. 24.

Dilleniaceae

SAURAUIA KEGELIANA Schlecht. *73*. Finca Paraiso, alt. 3200′. Jan. 14; *222*. Finca San Antonio, alt. 3000′. Jan. 23; *436*. Crater, Volcano San Salvador, alt. 4700′. Feb. 2.

SAURAUIA SUBALPINA Donn. Smith. *755*. San. Miguel, alt. 2600′. Feb. 22.

Guttiferae

CLUSIA GUATEMALENSIS Hemsl. *105, 108*. Finca Paraiso, alt. 3200′. Jan. 14; *239*. Finca San Antonio, alt. 3000′. Jan. 23; *786*. Hacienda San Miguel. alt. 2600′. Feb. 22.

Flacourtiaceae

CASEARIA LAEVIS Standl. *565*. La Libertad, alt. sea level. Feb. 11.

OLMEDIELLA BETSCHLERIANA (Goepp.) Loes. *905*. Cerro Miramundo, alt. 8700′. Feb. 25.

XYLOSMA FLEXUOSUM (HBK) Hemsl. *253*. Finca San Antonio, alt. 3000′. Jan. 23; *770*. San Miguel, alt. 2600′. Feb. 22.

Passifloraceae

PASSIFLORA MEMBRANACEA Benth. *685*. Volcano Santa Ana, alt. 7800′. Feb. 19.

Begoniaceae

BEGONIA BARBANA C. DC. *392*. Volcano San Salvador, alt. 5000′. Jan. 31; *893*. Cerro Miramundo, alt. 8700′. Feb. 25.

BEGONIA CALDERONII Standl. *913*. Cerro Miramundo, alt. 8700′. Feb. 25.

Thymelaeaceae

DAPHNOPSIS MALACOPHYLLA Standl. & Steyerm. *919*. Cerro Miramundo, alt. 8700′. Feb. 25.

Myrtaceae

CALYPTRANTHES PENDULA Berg. *920*. Cerro Miramundo, alt. 8700′. Feb. 25.

MYRTUS MONTANA Benth. *883, 884*. Cerro Miramundo, alt. 8700′. Feb. 25.

Melastomaceae

CENTRADENIA BERNOULLII Cario. *1*. San Marcos, alt. 2600′. Jan. 10.

HETEROCENTRON GLANDULOSUM Schenck. *15*. San Marcos, alt. 2600′. Jan. 10.

HETEROTRICHUM GLANDULOSUM Schenck. *377*. Finca Florencia, alt. 6200′. Jan. 30.

MICONIA GLABERRIMA (Schlecht.) Naud. *914*. Cerro Miramundo, alt. 8700′. Feb. 25.

MICONIA GUATEMALENSIS Cogn. *693*. Volcano Santa Ana, alt. 7800′. Feb. 19.

MICONIA LAURIFORMIS Naud. *943*. Cerro Miramundo, alt. 8700′. Feb. 25.

MICONIA PTEROPODA Benth. *577*. La Palma, alt. 5000′. Feb. 12.
MONOCHAETUM DEPPEANUM (S. & C.) Naud. *701*. Volcano Santa Ana, alt. 7800′. Feb. 19.

Onagraceae

FUCHSIA ARBORESCENS Sims. *698*. Volcano Santa Ana, alt. 7800′. Feb. 19; *987*. Cerro Miramundo, alt. 8700′. Feb. 25.
FUCHSIA MICHOACANENSIS. Sesse & Moc. *326*. Cerro Chulo, alt. 4000′. Jan. 28; *498*. Finca Florencia, alt. 6200′. Jan. 30.
LOPEZIA MEXICANA Juss. *371, 384a*. Finca Florencia, alt. 6200′. Jan. 30.
OENOTHERA SIMSIANA Seringe. *721*. Volcano Santa Ana, alt. 7800′. Feb. 19.

Umbelliferae

APIUM LEPTOPHYLLUM (DC.) F. Muell. *252*. Finca San Antonio, alt. 3000′. Jan. 22; *397*. Volcano San Salvador, alt. 6300′. Jan. 31.
SANICULA LIBERTA Schl. & Cham. *888*. Cerro Miramundo, alt. 8700′. Feb. 25.

Clethraceae

CLETHRA PACHECOANA Standl. & Steyerm. *709*. Volcano Santa Ana, alt. 7800′. Feb. 19.
CLETHRA SALVADORENSIS Britton. *447*. Crater, Volcano San Salvador, alt. 4700′. Feb. 2.

Pyrolaceae

CHIMAPHILA UMBELLATA var. MEXICANA DC. *602*. La Palma, alt. 5000′. Feb. 12.

Ericaceae

CAVENDISHIA GUATEMALENSIS Loes. *910, 978*. Cerro Miramundo, alt. 8700′. Feb. 25.
GAULTHERIA CHIAPENSIS Camp. *880*. Cerro Miramundo, alt. 8700′. Feb. 25.
GAULTHERIA LANCIFOLIA var. DULCIS Camp. *700*. Volcano Santa Ana, alt. 7800′. Feb. 19.
VACCINIUM POASANUM Donn. Smith. *916, 944*. Cerro Miramundo, alt. 8700′. Feb. 25.
LEUCOTHOEINA MEXICANA (Hemsl.) Small. *956*. Cerro Miramundo, alt. 8700′. Feb. 25.

Myrsinaceae

ARDISIA BREVIFOLIA Standl. & Steyerm. *877*. Cerro Miramundo, alt. 8700′. Feb. 25.

Styracaceae

STYRAX POLYNEURUS Perk. *690*. Volcano Santa Ana, alt. 7800′. Feb. 19.

Loganiaceae

BUDDLEIA NITIDA Benth. *458*. Volcano San Salvador, alt. 6700′. Feb. 3.

Apocynaceae

STEMMADENIA DONNELL–SMITHII (Rose) Woodson. *646, 649*. San Vicente, alt. 2000′. Feb. 14.

Asclepiadaceae

SARCOSTEMMA CLUSUM (Jacq.) Schltr. *1013.* Hacienda La Barra, alt. 1400′. Feb. 27.

Convolvulaceae

IPOMŒA SANTAE-ROSAE Standl. & Steyerm. *95.* Finca Paraiso, alt. 3200′. Jan. 14; *194.* Finca Germania, alt. 3000′. Jan. 22.

Boraginaceae

BOURRERIA HUANITA (L. & L.) Hemsl. *234.* Finca San Antonio, alt. 3000′. Jan. 23.

CORDIA DENTATA Poir. *290.* Cuyagualo, alt. 1000′. Jan. 27; *555.* La Libertad, sea level. Feb. 11.

HELIOTROPIUM OAXACANUM DC. *743.* Hacienda San Miguel, alt. 2600′. Feb. 22.

HELIOTROPIUM RUFIPILUM (Benth.) I. M. Johnston. *71.* Finca Paraiso, alt. 3200′. Jan. 14; *827.* Hacienda San Miguel, alt. 2000′. Feb. 23.

Verbenaceae

LANTANA HISPIDA HBK. *989.* Cerro Miramundo, alt. 8700′. Feb. 25.

LIPPIA SUBSTRIGOSA TURCZ. *380.* Finca Florencia, alt. 6200′. Jan. 30.

STACHYTARPHETA FRANTZII Polak. *354.* Cerro Chulo, alt. 4000′. Jan. 28.

Labiatae

Salvia Carlsonae Standl. & Steyerm. sp. nov. ined. *453.* Volcano San Salvador, alt. 5500′. Feb. 3; *986.* Cerro Miramundo, alt. 8700′. Feb. 25.

SALVIA KARWINSKII Benth. *858* Hacienda San José, alt. 5400′: Feb. 24; *991.* Cerro Miramundo, alt. 8700′. Feb. 25.

SALVIA SHANNONI Donn. Smith. *587.* La Palma, alt. 5000′. Feb. 12, *808.* Hacienda San Miguel, alt. 2600′. Feb. 22.

Solanaceae

CESTRUM GUATEMALENSE Francey. *712.* Volcano Santa Ana, alt. 7800′. Feb. 19.

LYCIANTHES ARRAZOLENSIS (Coult. & D. Sm.) Bitter. *681.* Volcano Santa Ana, alt. 7800′. Feb. 19.

Scrophulariaceae

CASTILLEJA INTEGRIFOLIA L. f. *992.* Cerro Miramundo, alt. 8700′. Feb. 25.

Lentibulariaceae

PINGUICULA MORANENSIS HBK. *885.* Cerro Miramundo, alt. 8700′. Feb. 25.

Acanthaceae

APHELANDRA GIGANTIFLORA Lindau. *89.* Finca Paraiso, alt. 3200′. Jan. 14.

ODONTONEMA TUBIFLORUM (Bertol.) Kuntze. *83.* Finca Paraiso, alt. 3200′. Jan. 14.

Rubiaceae

CEPHAELIS AXILLARIS Schwartz. *896.* Cerro Miramundo, alt. 8700′. Feb. 25.

RONDELETIA LANIFLORA Benth. *683, 708.* Volcano Santa Ana, alt. 7800′. Feb. 19.

Caprifoliaceae

VIBURNUM GUATEMALENSE Gandoger. *389, 459.* Finca Florencia, Volcano San Salvador, alt. 5000′. Jan. 30.

Compositae

BIDENS PILOSA VAR. MUCRONATA F. ODORATA (Cav.) Sherff. *687.* Volcano Santa Ana, alt. 7800′. Feb. 19.

CIRSIUM SUBCORIACEUM (Less.) Sch. Bip. *705.* Volcano Santa Ana, alt. 7800′. Feb. 19.

CONYZA APURENSIS HBK. *302.* Cuyagualo, alt. 1000′. Jan. 27.

ELEPHANTOPUS MOLLIS HBK. *12.* San Marcos, alt. 2600′. Jan. 10.

EUPATORIUM ARALIAEFOLIUM Less. *917.* Cerro Miramundo, alt. 8700′. Feb. 25.

EUPATORIUM COULTERI Robinson. *475.* Volcano San Salvador, alt. 6700′. Feb. 3.

EUPATORIUM LIGUSTRINUM DC. *604.* La Palma, alt. 4000′. Feb. 12.

EUPATORIUM LUXII Robinson. *715.* Volcano Santa Ana, alt. 7800′. Feb. 19.

EUPATORIUM MAIRETIANUM DC. *950.* Cerro Miramundo, alt. 8700′. Feb. 25.

EUPATORIUM MICROSTEMON Steetz. *854.* Los Planes, alt. 3500′. Jan. 10.

EUPATORIUM SKUTCHII Robinson. *385.* Finca Florencia, alt. 5000′. Jan. 30.

GNAPHALIUM AMERICANUM Mill. *351.* Cerro Chulo, alt. 4000′. Jan. 28.

LIABUM SUBLOBATUM Robinson. *174.* Finca Santa María, alt. 2500′. Jan. 19. *387.* Finca Florencia, alt. 5000′. Jan. 30; *442.* Crater, Volcano San Salvador, alt. 4700′. Feb. 2.

MELAMPODIUM OBLONGIFOLIUM DC. *106.* Finca Paraiso, alt. 3200′. Jan. 14; *405.* Volcano San Salvador, alt. 6300′. Jan. 31; *873.* Cerro Miramundo, alt. 8700′. Feb. 25.

MELANTHERA NIVEA (L.) Small. *13.* San Marcos, alt. 2600′. Jan. 10; *468.* Volcano San Salvador, alt. 6300′. Jan. 31.

PEREZIA NUDICAULIS Gray. *596.* La Palma, alt. 4000′. Feb. 12; *759.* San Miguel, alt. 2600′. Feb. 22.

SENECIO ARBORESCENS Steetz. *711.* Volcano Santa Ana, alt. 7800′. Feb. 19.

SENECIO CHINOTEGENSIS Klatt. *27.* Los Planes, alt. 3500′. Jan. 11.

SENECIO PETASIOIDES Greenm. *379.* Finca Florencia, alt. 5000′. Jan. 30; *947.* Cerro Miramundo, alt. 8700′. Feb. 25.

SENECIO SERRAQUITCHENSIS Greenm. *465.* Volcano San Salvador, alt. 6700′. Feb. 3; *780.* Hacienda San Miguel, alt. 2600′. Feb. 22; *988.* Cerro Miramundo, alt. 8700′, Feb. 25.

SENECIO THOMASH Klatt. *742.* Hacienda San Miguel, alt. 2600′. Feb. 22; *959.* Cerro Miramundo, alt. 8700′. Feb. 25.

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Literature Cited

1. **Kovar, Anton.** Idea general de la vegetación de El Salvador. *In:* Frans Verdoorn (ed.), Plants and plant science in Latin America 56, 57. The Chronica Botanica Company, 1945.
2. **Standley, Paul C. & Calderon, Salvador.** Lista preliminar de las plantas de El Salvador. San Salvador, 1926.
3. **Tucker, J. M. & Muller, C. H.** Additions to the oak flora of El Salvador. Madroño 7: 111–117. 1945.

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ON RAFINESQUE'S NAMES FOR THE CHARACEAE

R. D. WOOD

Rafinesque's very sketchy contributions to the literature on the Characeae extended from 1808 to 1836, and appear to be limited to one order, four genera, and eight species. All of these, except for the one Linnean genus *Chara*, have been entirely overlooked by specialists; and it remained for Merrill (1943) to bring these works to the attention of the botanical world.

A study of the original descriptions, in light of the existing knowledge of the Characeae of the United States, has enabled the writer to reconstruct what possibly seems to be a plausible interpretation of Rafinesque's original meanings. The statement that "This G[enus] (Leiacina) with Chara and Acinaria Raf. 1819, form [the] natural order Characea, near the Confervas" (Raf. 1825, p. 4) affords the clue that Rafinesque recognized three separate genera, and that he considered them an unique order of the algae. Though what synonymy exists is confused, in reconstructing the picture, the bulk of meager evidence would suggest that he recognized what we now distinguish as the genera *Chara*, *Nitella*, and *Tolypella*. Despite this conclusion, a strict interpretation of the available data requires allocation of his genera to only *Nitella* and *Chara*.

The writer is indebted to E. D. Merrill for bringing these facts to his attention, and for making the excellent collection of these old works available for study.

CHARACEAE Richard apud Humboldt & Bonpland

CHARACEAE Richard ap. Humboldt & Bonpland, Nov. Gen. Spec. Plant. **1**: 38. 1815. *Characea* Raf. Neogenyton 4. 1825, nom. nov.

"This G[enus] (Leiacina) with Chara and Acinaria Raf. 1819, form [the] natural order Characea, near Confervas."

Rafinesque's usage strongly indicates that his order corresponds to the modern concept of family. Accordingly, the present writer has cited the family Characeae as the synonym of Characea Raf. instead of the order Charales.

CHARA Vaill. ex Linn.

CHARA Vaill. ex L. Gen. Plant. ed. 5. 491. 1754; Raf. Med. Repos. II, **5**: 354. 1808, nom.; Merrill, Farlowia **1**: 252. 1943. *Characias* Raf. Anal. Nat. Tab. Univ. 209. 1815, nom.; Raf. Fl. Telluriana **1**: 56. 1836, nom. (= *Chara* L.); Merrill, Farlowia **1**: 252. 1943 (= *Chara* L.).

CHARA CONTRARIA Kützing, Phyc. Germ. 258. 1845. ? *C. fetidissima* Raf. [nom. nud.] Med. Repos. II, **5**: 354. 1808, nom.; Raf. Jour. Bot. (Paris) **2**: 174. 1809, nom. (for Eastern United States); Merrill, Farlowia **1**: 252. 1943.

CHARA sp. ? *Chara patens* Raf. [nom. nud.] Med. Repos. II, **5**: 354. 1808, nom.; Raf. Jour. Bot. (Paris) **2**: 174. 1809, nom.; Merrill, Farlowia **1**: 252. 1943.

NITELLA Ag. emend. Braun

NITELLA Ag. Syst. Alg. xxvii. 1824; emend. Braun, Hooker's Jour. Bot. **1**: 195, 292. 1849. ? *Leiacina* Raf. [nom. inq.] Neogenyton 4. 1825, descr.; Merrill, Farlowia **1**: 253. 1943. [= *Nitella*, pro synon. per *N. capitellata* Braun (= *C. capitata* Elliott = *L. capitata* (Ell.) Raf.)] (= *Tolypella*, pro descr.). ? *Acinaria* Raf. [nom. inq.] Jour. Phys. Chim. Hist. Nat. **89**: 107. 1819, descr.; iter. Isis von Oken 1820, **1**: Lit. Anz. 243. 1820, descr.; Raf. Neogenyton 4. 1825, nom. = *Chara* Linn. [pro parte]; Merrill, Farlowia **1**: 251. 1943.

"65. Leiacina. Diff. *Chara;* fruit berry-like, smooth, monolocular, polysperm, with four persistent scales at the base; top naked. *Stems terete, articulate; leaves acute in whorls; fruits axillary, capitate*" (Raf. 1820).

Based on *L. capitata* Raf. (below), this genus must be officially considered synonymous with *Nitella* Ag., pro synon. The genus description, on the other hand, suggests *Tolypella*, particularly in being capitate, a condition which is particularly characteristic of this genus.

"48. *Acinaria.* (Algue fluviatile.) Thallus creux et articulé, polytome; lanières étroites à nervures longitudinales, planes. Fructification hypophylle en dessous des lanières, en grains moux, arrondis, rouges: cocciformes, disposés longitudinalement sur 2 ou 3 rangs.—Famille des Fucidées. Est-ce bien un genre d'Algue ? Il y en a plusieurs espèces dans l'Ohio, le Mississipi, le Missouri, l'Arkanzas, etc." (Raf. 1820).

The description, though imperfect, fits *Nitella* in many particulars. The round, red fruits enveloped in mucus leaves little doubt of the accuracy of this determination.

NITELLA CAPITELLATA Braun, Abh. Akad. Wiss. Berlin **1882**: 56. 1883. ? *Leiacina capitata* Raf. [nom. ambig.] Neogenyton 4. 1825; Merrill, l. c. (Non) *Chara capillaris* Krocker, Florae Silesiacae **3**: 62. 1814. (Non) *C. capitata* Nees v. Esenbeck, Denkschr. Beierisch. Bot. Ges. **2**: 80. 1818. *C. capitata* Elliott, Bot. S. C. & G. **2**: 516. 1824.

"2. *L. capitata,* (*Chara* do. E.)[1] leaves terete by six, fruits pedicellate."

This description does not apply to *C. capitata* Elliott, since the fruiting heads are not pedicellate in that species. It is felt that Rafinesque apparently misidentified what material he had in hand, and that the plant was more likely a *Tolypella.*

NITELLA sp. ? *L. lucida* Raf. [nom. inq.] Neogenyton 4. 1825; Merrill, l. c. "*L. lucida,* leaves filiform by seven to nine, fruits subsessile."

The writer finds this description inadequate to attempt a determination.

NITELLA ACUMINATA Wallm. Sv. Vets.-Akad. Handl. **1852**: 263. 1854. ? *A. flexuosa* Raf. [nom. inq.] Jour. Phys. Chim. Hist. Nat. **89**: 107. 1819, descr.; Raf. Isis von Oken 1820, **1**: Lit. Anz. 243. 1820; Raf. Neogenyton 4. 1825; Merrill, Farlowia **1**: 251. 1943.

"1. *A. flexuosa.* Lanières linéaires, aiguës, flexueuses, ondulées, éparses" (Raf. 1820).

The description is inadequate from which to determine the species of *Nitella*, though the pointed leaves suggest one of the *N. acuminata* group

[1] "*Chara do E.*" = *Chara capitata* Elliott.

which has acuminate leaves in contrast to the blunt leaves of the following species.

NITELLA FLEXILIS (L. pro parte) Ag. Syst. Alg. 124. 1824. ? *A. coccifera* Raf. [nom. inq.] Jour. Phys. Chim. Hist. Nat. **89**: 107. 1819; Raf. Isis von Oken 1820 **1**: Lit. Anz. 243. 1820; Raf. Neogenyton 4. 1825; Merrill, Farlowia **1**: 251. 1943.

"2. *A. coccifera*. Lanières linéaires, lanceolées, éparses, obtuses, planes" (Raf. 1820).

The description is inadequate for determination, but the obtuse leaves suggest the common *Nitella flexilis*, or one of the species which has rather blunt apices in contrast to the acuminate ones in the *N. acuminata* series.

NITELLA sp. ? *A. latifolia* Raf. [nom. inq.] Jour. Phys. Chim. Hist. Nat. **89**: 107. 1819, descr.; Raf. Isis von Oken 1820 **1**: Lit. Anz. 243. 1820; Raf. Neogenyton 4. 1825; Merrill, Farlowia **1**: 251. 1943.

"3. *A. latifolia*. Feuilles lanceolées, presque opposées! ou plantes dichotome, lanières terminales, étroites; grains conglobés, brun-rougeatres" (Raf. 1820).

This very confusing description is certainly unlike a Charophyte, which, despite the fact that certain dried material might be so arranged as to appear dichotomous, hardly could show the other features listed. How a *Nitella* leaf could be construed to be lanceolate is a question, except perhaps in certain forms of *N. clavata* with inflated leaflets. The description of aggregated, reddish-brown fruits could fit a *Nitella* as well as certain other aquatic plants.

NITELLA PRAELONGA Braun, Abh. Akad. Wiss. Berlin **1882**: 40. 1883. ? *A. salicifolia* Raf. [nom. inq.] Jour. Phys. Chim. Hist. Nat. **89**: 107. 1819, descr.; Raf. Isis von Oken 1820 **1**: Lit. Anz. 243. 1820; Raf. Neogenyton 4. 1825; Merrill, Farlowia **1**: 251. 1943.

"4. *A. salicifolia*. Lanières linéaires, aiguës, planes, grains terminaux spiciformes. Dans Red-River [Louisiana or Texas ?]" (Raf. 1820).

This description is as confusing as that for the preceding species. The statement that fruits are in terminal spikes would suggest *Nitella Morongii* Allen or *N. praelonga* Braun. The distribution eliminates the first which so far as is known is restricted to northeastern North America, and strongly substantiates the latter which is well represented throughout the south central states, particularly Texas. Furthermore, *N. praelonga* has fertile whorls contracted into somewhat spike-like "heads" borne terminally.

DISCUSSION

The significance of Rafinesque's works becomes highly critical in terms of the homonym rule. Were his classification to be recognized, *Characias* Raf. (1815) would be a synonym of *Chara* Vaill. ex Linn. (1754), and *Leiacina* Raf. (1825) of *Nitella* Ag. (1824) emend. Braun (1849); but *Leiacina* Raf., if reinterpreted, would take priority over *Tolypella* Braun (1849) emend. Leonhardi (1863), and *Acinaria* Raf. (1819) over *Nitella* Ag. (1824). Furthermore, his various species might be construed to take priority over later-described species. Perhaps fortunately, no specimens remain of Rafinesque's Characeae upon which one might establish his names.

Since the treatment by Rafinesque is so vague as to leave modern stu-

dents to conjecture upon possible identities; since no specimens remain upon which to establish names; since no figures of the Characeae remain; since the only genera substantiated by synonymy with earlier genera names or specimens, i.e., *Characias* and *Leiacina*, are both later homonyms; since the descriptions are insufficient and too confusing to make determination possible; the writer concludes that the entire series of species and the questionable genera must be disposed of as nomina inquirenda, and be assigned in synonymy to the categories to which they appear to approach.

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Literature Cited

Agardh, C. A. 1824. Systema Algarum, I. Lund.

Braun, A. 1849. Characeae australis et antarcticae. Hooker's Jour. Bot. & Kew Gard. Misc. **1**: 192–203.

————. 1849. Characeae Indiae Orientalis et insularum Maris Pacificis. Hooker's Jour. Bot. & Kew Gard. Misc. **1**: 292–301.

————. 1883. Fragmente einer Monographie der Characeen. Nach der hinterlassenen Manuscripten A. Braun's herausgegeben von Dr. O. Nordstedt. Abh. Akad. Wiss. Berlin **1882**: 1–211.

Elliott, S. 1824. Sketch of the Botany of South Carolina and Georgia II. Charleston.

Krocker, A. J. 1814. Florae Silesiacae, vol. III. [Other volumes were entitled Flora Silesiaca.] Breslau.

Kützing, F. T. 1845. Phycologia Germanica. Nordhausen.

Leonhardi, H. von. 1863. Die böhmischen Characeen. Lotos **13**: 55–80, 110–111.

Linnaeus, C. 1754. Genera Plantarum, ed. 5. Stockholm.

Merrill, E. D. 1943. An index to Rafinesque's published technical names for the cellular cryptogams. Farlowia **1**: 245–262.

————. Index Rafinesquianus. [in preparation.]

Nees von Esenbeck, C. G. 1818. *Chara capitata*, eine neue Art von Armleuchter nebst Bemerkungen über die Fruchttheile der Gattung. Denkschr. Beierisch. Bot. Ges. **2**: 64–83.

Rafinesque, C. S. 1808. Prospectus of Mr. Rafinesque Schmaltz's two intended works on North American botany; the first on the new genera and species of plants discovered by himself, and the second on the natural history of the funguses, or mushroom tribe of America. Medical Repository II. **5**: 350–356.

————. 1809. Journal de Botanique (société de botanistes; Paris) **2**: 174.

————. 1815. Analyse de la nature; ou, Tableau de l'univers et des corps organisés. Palerme. 224 pp.

————. 1819. Prodrome des nouveaux Genres des plantes observées en 1817 et 1818 dans l'interieur des Étas Unis d'Amerique. Jour. Phys. Chim. Hist. Nat. **89**: 107.

————. 1820. ibid. Isis von Oken 1820 **1**: Lit. Anz. p. 243.

————. 1825. Neogenyton, or indication of sixty-six new genera of plants of North America, p. 4. Lexington?, Ky.

————. 1836. Flora Telluriana, Part I. Lexington, Ky.

Richard, L. C. M. 1815. *In*: Bonpland and Humboldt, Nova Genera et Species Plantarum **1**: 38. Paris.

Wallman, J. 1854. Försök till en systematisck uppställning af växtfamiljen Characeae. Sv. Vets.-Akad. Handl. **1852**: 231–331.

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PLANT EXPLORATIONS IN GUIANA IN 1944, CHIEFLY TO THE TAFELBERG AND THE KAIETEUR PLATEAU—III

BASSETT MAGUIRE AND COLLABORATORS

PIPERACEAE[40]

The Piperaceae is a large family with several hundred species distributed in the tropics and subtropics throughout the world. The largest number of species is to be found in the Americas where they range from the West Indies and Mexico through Central and South America to Argentina and Chile. The two principal genera are *Piper* and *Peperomia*.

PIPER L.

Mostly shrubs or small trees, occasionally scandent, or sometimes the plants are subherbaceous; leaves stipulate, always alternate, petiole frequently vaginate-winged; flowers small, in a dense, leaf-opposed spike, subtended by small, variously shaped glabrous or pubescent bracts; fruit small, drupe-like, with a thin pericarp; stigmas various but commonly 3. A very large genus with a great many tropical American species. Some of the Old World species are economically important, but the American species have little if any use.

PIPER ADENANDRUM (Miq.) C. DC. *Piper acarouanyanum* C. DC. in DC. Prodr. **16**[1]: 311. 1869. BRITISH GUIANA: frequent in dense second growth in windfall opening, heavy mora forest, Kamuni Creek, Groete Creek, Essequibo River, *22870;* Verite Creek, Essequibo River, *F3626*. Also known from French Guiana.

PIPER ADUNCUM L. A shrub or small tree with sparsely pubescent twigs; leaves lanceolate to subelliptic, with pointed apex and rounded or cordulate base, about three times as long as wide, more or less pubescent and scabrous; spikes up to 15 cm. long, gradually curved; peduncle mostly longer than the petiole. SURINAM: coastal jungle, road to Carl Francois along Saramacca River, Km. 40 from Paramaribo, *27171;* frequent, Charlesburg Rift, 3 km. north of Paramaribo, *22784*. A very common and widespread species ranging from the West Indies to the mainland and nearly throughout the range of the genus in South America.

PIPER AEQUALE Vahl. A glabrous shrub with slender branches; leaves more or less elliptic or ovate, very variable in size, up to 15–17 cm. long, pinnately nerved to the upper third or nearly throughout, the nerves yellowish beneath, with attenuately blunt-acuminate apex and subequilaterally acute base, rather firm and somewhat glossy; spikes up to 10 cm. long. SURINAM: frequent on wet rocks in shaded places, base of cliffs, Augustus Falls, Tafelberg, *24769*. This collection is sterile but is believed to represent this species which is rather common and widely distributed from the West Indies throughout northern South America.

[40] T. G. Yuncker.

PIPER ARBOREUM Aubl. A glabrous shrub or small tree up to 7 m. tall, with more or less verrucose-warty internodes; leaves oblong-elliptic to subovate with acuminate apex and strongly inequilaterally rounded base with one side much shorter; petiole vaginate-winged to the blade; spikes slender and mostly 5–10 cm. long; fruit laterally flattened. BRITISH GUIANA: roadside, second growth, Mabaruma, Aruka River, Northwest District, *G5109*. SURINAM: east side, savanna, Zanderij I, *25056;* frequent, overhanging North Ridge Creek, Tafelberg, *24826;* infrequent, Charlesburg Rift, primary jungle, 3 km. north of Paramaribo, *22791*. A rather common species ranging through the West Indies and northeastern South America.

PIPER AUGUSTUM RUDGE. A shrub or small tree to 5 or 8 m. tall, glabrous except for the more or less pubescent nerves beneath; leaves elliptic-ovate, 15–30 cm. or more long, acute at both ends, pinnately nerved throughout, glandular-dotted, spikes up to 15 mm. thick × 8–12 cm. long when mature. SURINAM: infrequent, south rocky slopes Arrowhead Basin, Tafelberg, *24609*. Rather widely distributed throughout northern South America.

PIPER CITRIFOLIUM Lam. A shrub up to 3 m. tall, glabrous except for the ciliate petiole keel and decurrent ridge; leaves lance- or oblong-elliptic, 8–16 cm. long, with acuminate apex and acute base, pinnately nerved throughout; spikes 3–4 cm. long. BRITISH GUIANA: frequent along trail, in heavy mora forest, Kamuni Creek, Groete Creek, Essequibo River, *22864*. Distributed throughout the Guianas.

PIPER DEMERARANUM (Miq.) C. DC. A shrub 1–2 m. tall; twigs somewhat retrorsely crisp-pubescent; leaves elliptic, sublanceolate or oblanceolate, 15–20 cm. long, with acuminate apex and inequilaterally cordulate base, pinnately nerved throughout; petiole vaginate to the blade; spikes up to 4.5 cm. long; fruit depressed-globose, puberulent. BRITISH GUIANA: clearing, Mazaruni Station, Mazaruni River, *F3530*. Distributed through northeastern South America.

PIPER GLABRESCENS (Miq.) C. DC. var. **caparonum** (C. DC.) Yuncker, comb. nov. *Piper caparonum* C. DC. in Urb. Symb. Ant. **7**: 183. 1912. BRITISH GUIANA: secondary forest on lateritic gravelly soil, Mabaruma, Aruka River, Northwest District, *F5162;* secondary forest on clay soil, Mazaruni Station, Mazaruni River, *F3542*. Also known from Trinidad.

Piper Gleasonii Yuncker, sp. nov. Frutex, internodiis longis satis gracilibus, obscure et subretrorse hirsutis; folia elongato-elliptica, 20–27 cm. longa, 8–11 cm. lata, acute acuminata, basi inequilateraliter obtusa, latere uno quam altero 3–5 cm. breviore, pinnato-nervata, nervis quoque latere ca. 10 cum nervis minoribus intermediis, in sicco coriacea, nitida, revoluta, translucentia, supra glabra impresso-foveolata, subtus ad nervos hirsuta; petiolus 1–2 cm. longus, dense hirsutus, ad laminam vaginatus et anguste alatus; spicae 11 cm. longa 4 mm. in diametro; pedunculus 2 cm. longus, subretrorse hirtellus; bracteae triangulari-subpeltatae, margine dense fimbriatae; fructus depresso-obovoideus, velutinus, circum stigmata 3 sessilia convallatus.

A shrub; flowering internodes long and rather slender, dingy-subretrorsely-hirsute; leaves elongated-elliptic, 8–11 cm. wide × 20–27 cm. long, apex sharply acuminate, inequilaterally obtuse at the base with one side 3–5 mm. shorter at the petiole, pinnately nerved throughout, the nerves about 10 on each side, with intermediates, drying coriaceous, glossy, revolute,

translucent, glabrous and impressed-pitted above, staring-hirsute on the nerves beneath; petiole 1–2 cm. long, densely hirsute, vaginate and narrowly winged to the blade; spikes 4 mm. thick × 11 cm. long; peduncle 2 cm. long, subretrorsely hirtellous; bracts triangular-subpeltate, marginally densely fringed; fruit depressed-obovoid, velvety, convallate about the 3 sessile stigmas.

The densely hirsute stems and nerves beneath, and velvety-puberulent depressed-obovoid fruit are distinctive of this species.

TYPE: Rockstone, British Guiana, July 15–August 1, 1921, *H. A. Gleason 857*. New York Botanical Garden. SURINAM: vicinity of Base Camp (1), Tafelberg Creek, Saramacca River Headwaters, *24112;* montane forest, line beyond Pakira Camp (4), Coppenam River Headwaters, *24170*.

PIPER HOSTMANNIANUM (Miq.) C. DC. A shrub, sometimes more or less scandent, generally crisply subsilky excepting the upper leaf surface; leaves more or less elliptic or subovate, 12–20 cm. or more long, apex acuminate, rather glossy, base oblique, inequilaterally obtuse or cordulate; nerves more or less impressed above; spikes 10–12 cm. long. BRITISH GUIANA: rope climbing to 10 m., high forest, Kamuni Creek, Groete Creek, Essequibo River, *22901*. Also known from Surinam and Venezuela.

Piper saramaccanum Yuncker, sp. nov. Frutex vel arbuscula 3 m. alta, internodiis superioribus satis gracilibus, brunneo-villosis; folia elliptico-subobovata, 30–33 cm. longa, 17–21 cm. lata, apice breviter abrupteque acuminata, basi oblique inaequilatera, ad petioli apicem abrupte acuta, latere breviore vix lobato, latere longiore cordato, lobo rotundato quam petiolo dimidio breviore, pinnatim nervatis, nervis utrinsecus ca. 7, cum nervis 2–3 brevioribus in lobum descendentibus, marginem versus paullo furcatis et arcuatim connectis, supra glabra praeter costam ad basin imam villosam, subtus tenuiter brunneo-pubescentia praecipue ad nervos, in sicco firmula coriacea; petiolus 6 cm. longus, dense brunneo-villosus, ad laminam vaginato-alatus; spica 28 cm. longa 3 mm. in diametro; pedunculus 4 cm. longus, pubescens; bracteae inflexo-subcucullatae, apice truncato subtriangulari fimbriato; ovarium subovoideum, a latera complanatum, cum rachide elongatum.

A shrub or small tree 3 m. tall; upper internodes rather slender, brown villous; leaves elliptic-subovate, 17–21 cm. wide × 30–33 cm. long, apex abruptly short-acuminate, base obliquely inequilateral, abruptly acute at the petiole, with the shorter side scarcely lobed, the longer side cordate with the lobe rounded and half as long as the petiole, pinnately nerved below the upper third, the nerves about 7 on each side with 2 or 3 shorter descending nerves in the lobe, the nerves somewhat branched upward and submarginally loop-connected, glabrous above except the midrib which is villous at the very base, thinly brown-pubescent beneath with the nerves more densely so, drying firm, coriaceous; petiole 6 cm. long, densely brown villous, vaginate-winged to the blade; spike 3 mm. thick × 28 cm. long; peduncle 4 cm. long, pubescent; bracts inflexed-subcucullate, the apex truncate subtriangular, marginally fringed; ovary subovoid, laterally flattened and elongated with the rachis.

TYPE: shrub or small tree to 3 m. high, spikes pendent, km. 3.5, vicinity Krappa Camp (2), Saramacca River Headwaters, Surinam, October 6, 1944, *Maguire 24887*. New York Botanical Garden. Known only from the type locality.

PIPER SUBMELANOSTICTUM C. DC. var. **amelanostictum** Yuncker, var. nov. Frutex 3 m. altus; folia 22–30 (35) cm. longa, 11–15 (20) cm. lata, non glanduloso-punctata; spicae 20–30 cm. longae.

A shrub 3 m. tall; leaves 11–15 (20) cm. wide × 22–30 (35) cm. long, not glandular dotted; spikes 20–30 cm. long. Otherwise as in the species.

TYPE: in dense upland forest, Rockstone, British Guiana, July 15–Aug. 1, 1921, *Gleason 566*, N. Y. Bot. Gard. SURINAM: frequent, in mixed high forest, base north escarpment, vicinity foot of Augustus Falls, Tafelberg, *24749*. The species from near Cayenne, French Guiana.

Piper Maguirei Yuncker, sp. nov. Frutex vix 0.5 m. altus; caulibus simplicibus, gracilibus, internodiis brevibus villosis; folia elliptica vel lanceolato-elliptica, 10–16 cm. longa, 4–6 cm. lata, apice obtusa, basi oblique subinequilateralia, latere vix breviore obtuso vel subacuto, latere longiore rotundato et obtuse vel paullo cordulato, pinnatim nervatis, nervis quoque latere ca. 10 marginem versus arcuatim connectis cum nervulis transversis anastomantibus, supra glabra, subtus ad nervis sparse crispato-pubescentia, glanduluoso-punctata, in sicco membranacea, translucentia; petiolus vix 5 mm. longus, villosus, basin versus vaginatus; apica 2 cm. longa, 2 mm. in diametro; pedunculus gracilis, 10 mm. longus, glaber; bracteae inflexo-cucullatae, glabrae vel paullo ciliatae, glanduloso-punctatae; ovarium ovoideum, rubro-glanduloso-punctatum, apice angustatum in stylum crassum brevissimum, aut stylus fere nullus; stigmata 3, recurvata.

A simple slender-stemmed shrub, scarcely 0.5 m. tall; internodes short and slender, villous; leaves elliptic or lance-elliptic, 4–6 cm. wide × 10–16 cm. long, apex obtuse, base obliquely subinequilateral with the shorter side obtuse or acutish, the longer side rounded and obtuse or slightly cordulate, pinnately nerved throughout, the nerves about 10 on each side, submarginally loop-connected and with slender cross-connecting and anastamosing nervules, glabrous above, the nerves beneath sparsely crisp-pubescent, glandular-dotted, drying membranous, translucent; petiole scant 5 mm. long, villous, vaginate toward the base; spike 2 mm. thick × 2 cm. long; peduncle slender, 10 mm. long, glabrous; bracts inflexed-cucullate, glabrous or slightly ciliate, glandular-dotted; ovary ovoid, red-glandular-dotted, narrowed at the apex into a very short, thick style, or scarcely stylose; stigmas 3, recurved.

TYPE: locally frequent, wet walls cataract, lower North Ridge Creek, Tafelberg, Surinam, September 19, 1944, *Maguire 24811*. New York Botanical Garden. Known only from the type locality.

PIPER MARGINATUM Jacq. An essentially glabrous shrub or small tree; leaves round-ovate, 10–20 cm. long, with acuminate apex and openly cordate base, palmately 9–11-nerved; petiole to 4 cm. or more long, vaginate-winged to near the blade; spikes 10 cm. or more long. SURINAM: frequent, annual to 1.5 m. high, primary jungle, Charlesburg Rift, 3 km. north of Paramaribo, *22739*. A very common species ranging from the West Indies to the mainland and throughout northern South America.

PIPER WACHENHEIMII Trel. A small, shade-loving subshrub to 1.5 m. tall, with densely brown-pilose twigs; leaves elliptic-suboblanceolate, 12–15 cm. long, with acuminate apex and acute base, pinnately nerved below the upper third, villous below; spikes 6 cm. long; fruit hirtellous. BRITISH GUIANA: frequent, in dense second growth in windfall opening, heavy mora forest, Kamuni Creek, Groete Creek, Essequibo River, *22869*. The type was col-

lected by Sandwith on Moraballi Creek near Bartica. Also known from Godebert, French Guiana.

PEPEROMIA R. & P.

Annual or perennial, usually fleshy, epiphytic or terrestrial herbs; sometimes with tuberous or corm-like stems; leaves alternate, opposite or verticillate, lacking stipules; flowers loosely or compactly crowded in a slender terminal, axillary or leaf-opposed spike, subtended by a usually round-peltate bract; stamens 2, stigma 1, fruit drupe-like, with very thin pericarp.

Widely distributed throughout the tropical and subtropical regions of the world.

PEPEROMIA ALATA R. & P. A glabrous, assurgent, epiphytic or terrestrial herb up to 30 or more cm. tall, with more or less zig-zag stems rather prominently winged with ridges decurrent from the nodes; leaves alternate lance-elliptic, commonly 6–12 cm. long, with acuminate apex and acute base, palmately 5–7-nerved; spikes 8–15 cm. long, fruit globose-ovoid with oblique apex. SURINAM: frequent on moist mossy rocks, base of north escarpment, vicinity foot of Augustus Falls, Tafelberg, *24757;* infrequent, epiphyte in high forest, base south escarpment, Arrowhead Basin, Tafelberg, *24519.* Distributed throughout northern South America.

PEPEROMIA ELONGATA H.B.K. var. **guianensis** Yuncker, var. nov. Plantae robustiores, caulibus longioribus magis pendulis; folia ex lanceolato-elliptica elliptico-ovata, 7–12 cm. longa, 3–4 cm. lata; petioli 1–2 cm. longi.

Plants more robust than the species, and with longer more pendulous stems; leaves lance-elliptic to elliptic-ovate, 3–4 cm. wide × 7–12 cm. long; petioles 1–2 cm. long. Otherwise similar to the species.

TYPE: Pomeroon District, Kamwatta, British Guiana, September 21, 1921, *La Cruz 1197,* U. S. National Herbarium, no. 1120034; isotype, New York Botanical Garden. BRITISH GUIANA: upper Rupununi River near Dadanawa, *De La Cruz 1520;* Northwest District, Mt. Everard, *De La Cruz 1304;* Anabisi River, *De La Cruz 1365;* epiphyte from rope in mora forest, Takutu Creek to Puruni River, Mazaruni River, *F4929; F4851.* Also from Venezuela.

PEPEROMIA GLABELLA (Sw.) A. Dietr. var. MELANOSTIGMA (Miq.) Dahlst. A rather small, black-dotted epiphyte, glabrous except for ciliate petioles and decurrent lines; leaves alternate, lanceolate, 3–8 cm. long, acute to acuminate at both ends, spikes slender, up to 12 cm. or more long; fruit globose-ovoid with an oblique apex. BRITISH GUIANA: epiphyte on upper branches of a mora tree, Takutu Creek to Puruni River, Mazaruni River, *F4855.* SURINAM: epiphyte in montane forest, Km. 15, Coppenam River Headwaters, *24160.* Also occurs in Venezuela and Colombia.

PEPEROMIA MACROSTACHYA (Vahl) A. Dietr. A trailing or pendent glabrous epiphytic herb; leaves alternate, subovate-elliptic, up to 6–10 cm. long, with acuminate apex and rounded-obtuse or acutish base; 7–9-plinerved, more or less ciliate; spikes slender, up to 20 or 30 cm. long; fruit subcylindric, up to 2 cm. long, with oblique apex. BRITISH GUIANA: growing intimately with *Cordonanthe* in ant nest, along timber trail in high mixed forest, Kamuni Creek, Groete Creek, Essequibo River, *22837;* rare, along Potaro River, above Kaiatuk, Kaieteur Plateau, *23379.* SURINAM: frequent in ant nest, high, mixed, wallaba forest, Km. 17, vicinity Black Water Camp (5),

Coppenam River Headwaters, *24846*. Rather common throughout northern South America.

PEPEROMIA MAGNOLIAEFOLIA (Jacq.) A. Dietr. A glabrous, succulent, terrestrial or epiphytic herb; leaves more or less alternate, elliptic-obovate, 6–15 cm. long, with rounded apex and cuneate base, pinnately nerved, spikes up to 15–20 cm. long, on a glabrous, bracted stalk 5–10 cm. long; fruit ellipsoidal with a long slender awl-shaped beak. BRITISH GUIANA: locally frequent, wet rocks along river, high mixed forest, Potaro River Gorge, *23522;* epiphyte in mora and mixed forest, Kamuni Creek, Groete Creek, Essequibo River, *22825;* Takutu Creek to Puruni River, Mazaruni River, *F4852*. SURINAM: frequent in high forest, base south escarpment, Arrowhead Basin, Tafelberg, *24520;* savanna, east side, Zanderij I, *25054*. A common species in the West Indies and northeastern South America.

Peperomia Maguirei Yuncker, sp. nov. Herba humilis ramosa subrepens et assurgens; caules 2 mm. in diametro, sursum villosi pilis curvato-adscendentibus, deorsum glabrescentes, internodiis 1–3 cm. longis; rami fructiferi adscendentes 5 cm. vel ultra e basi prostrata radicante, in sicco flavonitidi sulcati; folia elliptico-obovata, 12–20 mm. longa. 5–12 mm. lata, apice rotundata emarginata, ad basim acuta, trinervia, costa subtus prominenti, supra laxe pilosa glabrescentia, subtus glabra, in incisura apicali hirtella, in sicco coriacea, subnitentia, opaca, anguste revoluta; petiolus 2–5 mm. longus, pubescens; spicae terminales, 2 cm. longae, 2 mm. in diametro; pedunculus pubescens 1 cm. longus; bracteae rotundato-peltatae, glandulosopunctatae; fructus ca. 1 mm. longus, globosus, stylo brevi crasso, stigmatibus apicalibus.

A low, subrepent-assurgent, branched epiphytic herb; stems 2 mm. thick, upcurved-villous above, glabrescent below, internodes 1–3 cm. long, fruiting branches ascending to 5 cm. or more from the prostrate rooting base, drying yellow-glossy, sulcate; leaves elliptic-obovate 5–12 mm. wide × 12–20 mm. long, apex rounded, emarginate, base acute, palmately 3-nerved, the midrib prominent beneath, loosely pilose above glabrescent, glabrous beneath, hirtellous in the apical notch, drying coriaceous, somewhat glossy, opaque, narrowly revolute; petiole 2–5 mm. long, pubescent; spikes terminal, 2 mm. thick × 2 cm. long; peduncle 1 cm. long, pubescent; bracts round-peltate; glandular-dotted; fruit about 1 mm. long, globose, with a short thick style, stigmas apical.

TYPE: moist fallen log in high bush, vicinity southeast margin of Arrowhead Basin, Tafelberg, Surinam, August 19, 1944, *Maguire 24420*. New York Botanical Garden. Known only from the type locality.

PEPEROMIA OBTUSIFOLIA (L.) A. Dietr. A succulent, terrestrial or epiphytic herb, glabrous except for the minutely puberulent peduncle; leaves alternate elliptic-obovate mostly 8–12 cm. long, with rounded apex and cuneate base; spikes up to 15 cm. long; fruit ellipsoidal with a slender hooked beak. BRITISH GUIANA: rare, on tree trunks in mixed forest, trail from Tukeit to Kaiatuk Plateau, plateau level, *23090*. SURINAM: frequent, epiphyte in mixed montane high forest, North Ridge, Tafelberg, *24800*. A common species of the West Indies and throughout northern South America.

PEPEROMIA PANICULATA Regel. A short-stemmed succulent epiphyte, essentially glabrous; leaves alternate, elliptic or oblanceolate, 15–20 cm. long, acuminate at both ends, pinnately nerved, spikes about 1 cm. long, numerous

in an elongate spike-like paniculate cluster, the main stalk densely velvety; fruit subcylindrical with obliquely truncated apex. BRITISH GUIANA: epiphyte on *Manicaria* palm, Sebai Creek, Kaituma River, *F5152*. Also from French Guiana and Colombia.

PEPEROMIA PELLUCIDA (L.) H.B.K. A delicate, erect, branched, succulent, glabrous herb; leaves alternate, round-ovate, 1.5–3 cm. wide with acutish apex and subtruncate-cordate base; spikes up to 5 cm. long, fruit ellipsoidal, longitudinally somewhat sulcate-striate, stigma apical. SURINAM: frequent, vicinity Agricultural Experiment Station at Paramaribo, *22716*. A common weedy species found throughout the range of the genus in both hemispheres.

PEPEROMIA ROTUNDIFOLIA (L.) H.B.K. A slender, small, repent, mostly epiphytic plant; stems filiform; leaves alternate, round or round-elliptic, about 1 cm. long, loosely villous; spikes 2 cm. long; fruit globose-ovoid with oblique apex. BRITISH GUIANA: on fallen tree in mora forest, Kamuni Creek, Groete Creek, Essequibo River, *22819*. A common species found throughout the American range of the genus.

PEPEROMIA SERPENS (Sw.) Loud. A small, repent, crisp-pubescent epiphyte or terrestrial herb with slender stems; leaves alternate, round-subdeltoid, 1–2 cm. wide, palmately 3–5-nerved; spikes up to 3 cm. long; fruit ellipsoidal, with long slender beak. BRITISH GUIANA: on fallen tree, Takutu Creek to Puruni River, Mazaruni River, *F4901*. SURINAM: frequent, in swamps, vicinity Base Camp (1), Saramacca River Headwaters, *24092*. A common species found throughout nearly the entire American range of the genus.

Peperomia tafelbergensis Yuncker, sp. nov. Herba gracillima repens epiphytica; caules filiformes, satis laxe villosi, internodiis usque ad 2 cm. longis; rami fructiferi adscendentes usque ad 2–3 cm. longi e basi radicanti; folia valde variabilia, elliptica vel subobovata, 3 × 4 mm, 5 × 12 mm., 8 × 10 mm., vel 8 × 18 mm. lata longaque, apice obtusa, ad basim acuta vel in foliis latioribus obtusa, e basi trinervia, costa sursum furcata, supra laxe villosa, subtus glabra et pallidiore, ciliata, in sicco tenuia, pellucida; petiolus filiformis, 1–2 mm. longus, laxe villosus; spicae terminales, 15–20 mm. longae, 1 mm. in diametro, satis laxe floriferae; pedunculus filiformis, ca. 10 mm. longus, glaber; bracteae rotundato-peltatae, glanduloso-punctatae; fructus ovoideus, ca. 0.5 mm. longus, ad apicem obliquus; stigma subapicali.

A very slender repent epiphyte; stems filiform, rather loosely villous, internodes up to 2 cm. long, fruiting branches ascending to 2 or 3 cm. long from the rooting base; leaves very variable in shape and size, elliptic, subobovate, 3 mm. wide × 4 mm. long, 5 × 12, 8 × 10, or 8 × 18, apex obtuse, base acute or in broader leaves obtuse, palmately 3-nerved with the midrib branched upward, loosely villous above, glabrous and paler beneath, ciliate, drying thin, pellucid; petiole filiform, 1–2 mm. long, loosely villous; spikes terminal, 1 mm. thick × 15–20 mm. long, rather loosely flowered; peduncle filiform, about 10 mm. long, glabrous; bracts round-peltate, glandular-dotted; fruit ovoid, about 0.5 mm. long, apex oblique; stigma subapical.

TYPE: in high forest, base of south cliffs, Arrowhead Basin, Tafelberg, Surinam, August 24, 1944, *Maguire 27170*. New York Botanical Garden.

LACISTEMACEAE

LACISTEMA AGGREGATUM (Berg.) Rusby. BRITISH GUIANA: flowering spikes green, fruit scarlet, ovoid, tree 2–3 m. high, 2 cm. diameter, occasional,

in clearing, wallaba forest, Kaieteur Plateau, *23237*. Generally distributed in the Guianas: Mexico and the West Indies to Peru and the Amazon Basin.

L. AGGREGATUM var. **elongatum** Maguire, var. nov. Plantae similis a typo, sed spicis 3–5 cm. longis, pendentibus, axibusque basibus spicarum pubescentibus.

TYPE: flowers pale yellow, small tree 3 inches in diameter, Mazaruni Station, Mazaruni River, British Guiana, January 21, 1945, *Fanshawe 2200*. New York Botanical Garden. Cotype: small second-growth shrub about clearing, on brown sand, Mazaruni Station, *F.184*. In the widespread typical population the spikes are uniformly 1.5–2 cm. long. *Froes 2026* from Carutapera, Maranhaõ, Brazil, with spikes from 2–3 cm. long approaches in this character the var. *elongatum*.

ULMACEAE

TREMA MICRANTHA (L.) Blume. SURINAM: flowers greenish-white, fruit orange, small tree 8 m. high, primary jungle, Charlesburg Rift, 3 km. north of Paramaribo, *22798;* flowers white, small shrub with arching branches, islands in rapids, Saramacca River, between Jacob kondre and Kwatta hede, *23904*. Widely distributed, subtropical and tropical; southern Florida, West Indies, New Mexico, south to Peru, Paraguay and Brazil.

MORACEAE[41]

BROSIMUM GUIANENSE (Aubl.) Huber. BRITISH GUIANA: tree 12 m. high, the trunk 7 cm. in diam., greenheart forest on hill slope, leaves somewhat leathery, latex pale orange, fruits pale yellow, Mazaruni Station, *F539;* tree 21 m. high, the trunk 30 cm. in diam., mixed forest on brown sand, latex faintly yellow, not buttressed, local name Tibikushi, Mazaruni Station, *F630*. SURINAM: small tree to 7 m. high, infrequent, low forest 1 km. south of Savanna No. I, 570 m., alt., Tafelberg, *24358*. Guianas, northern Brazil, Bolivia(?).

Brosimum rotundatum Standl., sp. nov. Arbor alta fere glabra, ramulis gracilibus teretibus fusco-ferrugineis, sparse puberulis, cito glabratis, internodiis brevibus; stipulae parvae triangulari-ovatae 3–4 mm. longae brunneae acutiusculae caducae, sparse puberulae, mox glabratae; folia inter minora breviter petiolata firme chartacea, petiolo 4–5 mm. longo, sparse puberulo glabrescente; lamina anguste obovato-oblonga 4.5–8.5 cm. longa 2.5–3.5 cm. lata, apice late vel anguste rotundata, basin obliquum versus angustata, uno latere obtusa, altero acutissima, supra lucida glabra, costa nervisque obviis sed vix prominulis, subtus pallidior brunnescens, primo minutissime sparseque puberula, cito glabrata, costa tenera prominente, nervis lateralibus utroque latere ca. 14 teneris prominulis angulo lato abeuntibus fere rectis, remote a margine in nervum collectivum arcuato-conjunctis, venulis vix prominulis arcte reticulatis; pedunculi axillares solitarii plerumque 8–13 mm. longi graciles, glabri vel minute sparseque puberuli; capitula florifera 4–5 mm. lata, pauciflora; flores feminei 2 (vel ultra?); bracteae peltatae orbiculares, minutissime ciliolatae.

TYPE: tree 25 mm. high, the trunk 30 cm. in diam., not buttressed, from low "near" wallaba forest, latex pale yellow, fairly plentiful, leaves glauces-

[41] By Paul C. Standley.

cent beneath, receptacle turning yellow and orange as it ripens, vernacular name Tibikushi, Siba Creek, April 23, 1941, British Guiana, *Fanshawe 688*. Chicago Natural History Museum; New York Botanical Garden.

Referable to the group sometimes separated as a distinct genus, *Piratinera*. Noteworthy for the rounded apices of the leaves.

BROSIMUM VELUTINUM (Blake) Ducke. BRITISH GUIANA: tree 5 m. high, the trunk 10 cm. in diam., flower heads yellow, fruit scarlet, soft, fleshy, warty, obconical, occasional, below Tukeit, Potaro River Gorge, *23490*. British Guiana, Surinam, northern Brazil.

COUSSAPOA ANGUSTIFOLIA Aubl. SURINAM: tree 12 m. high, the trunk 20 cm. in diam., fruit yellowish, Jacob kondre, Saramacca River, *23867;* river banks above Kwatta hede, Saramacca River, *23942*. French Guiana.

I have seen no other material of this species, but the present collection agrees so well with Aublet's original illustration that there is little doubt that the Surinam tree is referred properly here.

COUSSAPOA MICROCEPHALA Trécul. BRITISH GUIANA: rope growing as shrub at cliff edge overlooking Kaieteur Gorge, Kaieteur Plateau, flowers pale cream, occasional, *23449*. SURINAM: tree to 15 m. high, the trunk 20 cm. in diam., no latex, forest slopes, 0.5 km. south of East Ridge, Tafelberg, 920 m., alt., *24588*. Known only from Surinam and British Guiana.

FICUS ALBERT-SMITHII Standl. BRITISH GUIANA: tree 3–4 m. high, the trunk 6 cm. in diam., copious latex, leaves rigid, leathery, fruit pink, occasional, bush island in savanna, Kaieteur Plateau, *23123;* tree 2–3 m. high, 8 cm. diam., fruit pink, globose, latex copious, occasional, Kaieteur savannas, *23214*. Known previously only from the type, from Kanuku Mountains, British Guiana.

FICUS ANGUSTIFOLIA Miq. BRITISH GUIANA: tree 30 m. high, the trunk 40 cm. in diam., the irregular spreading buttresses 2 m. high, originally epiphytic on an *Eschweilera* which it has not quite enveloped, fruit green, Groete Creek, lower Essequibo River, *F1987;* vernacular name Kumakaballi. Guianas, Venezuela, northern Brazil.

Ficus arctocarpa Standl., sp. nov. Subg. *Urostigma*. Arbor epiphytica, ramulis ca. 6 mm. diam. crassis pallidis vel brunneis dense adpresso-pilosis internodiis brevissimis vulgo 7 mm. longis vel breviorbus; stipulae longe persistentes anguste triangulari-ovatae brunneae ca. 1.5 cm. longae longiacuminatae, extus brunneo-pilosae vel serius glabratae; folia modica breviter petiolata, petiolo crassiusculo usque ad 1 cm. longo, vulgo breviore, piloso; lamina oblonga vel oblanceolato-oblonga 9–12.5 cm. longa 3–5.5 cm. lata, acuta vel abrupte apiculato-acuta, acumine obtuso, basin versus plus minusve angustata, basi ipsa obtusa, coriacea, supra in sicco fusca, costa plana vel impressa, nervis impressis, glabra, subtus brunnescens, ad costam nervosque brunneo-pilosa, aliter puberula vel glabrata, costa crassiuscula elevata, nervis lateralibus utroque latere ca. 9 prominentibus angulo lato adscendentibus, fere rectis, prope marginem in nervum collectivum irregularem arcuato-conjunctis, venulis prominulis reticulatis; receptacula arcte sessilia globosa 6–8 mm. diam. ubique densissime pilis longis brunnescentibus intertextis induta, ostiolo parvo, foliolis suberectis; involucrum bilobum ca. 4 mm. latum, extus dense adpresso-pilosum, lobis apice rotundatis, arcte adpressum.

TYPE: a strangler with trunk 10 cm. in diam., infrequent, bush to rear

of Jacob kondre, June 19, 1944, Saramacca River, Surinam, *Maguire 23865*. Chicago Natural History Museum; New York Botanical Garden.

In most characters this is like *F. Maguirei*, described on a following page. In that the receptacles are glabrous, while in *F. arctocarpa* they are very densely covered with long, more or less matted, shaggy hairs.

Ficus arukensis Standl., sp. nov. Subg. *Urostigma*. Arbor alta omnino glabra, ramulis cinnamomeis ca. 5 mm. crassis; stipulae caducae triangulari-ovatae ca. 17 mm. longae anguste acuminatae brunneae; internodia brevia; lamina folii anguste oblonga 9.5–17.5 cm. longa, 3.5–6 cm. lata, apice subrotundata atque abrupte cuspidato-acuminata, acumine 1–1.5 cm. long acuto, basi rotundata vel obtusissima, fere concolor, costa supra apicem versus prominente, basin versus sulcata, nervis venulisque prominentibus vel prominulis, costa subtus gracili prominente, nervis lateralibus utroque latere ca. 12 teneris prominulis angulo fere recto divergentibus fere rectis juxta marginem arcuato-conjunctis; pedunculi geminati crassi vix ultra 3 mm. longi et fere aequilati; involucrum bilobum ca. 6 mm. latum, lobis rotundatis; receptacula globosa 10–12 mm. diam. glabra, ostiolo apice prominente.

TYPE: epiphytic tree 12 m. tall, 10 cm. diam., latex white, leaves pale beneath, *Manicaria* swamp forest fringe, Mabaruma, Aruka River, N. W. D., British Guiana, March 23, 1945, *Fanshawe 2435*. Chicago Natural History Museum; New York Botanical Garden. Wanama River, N. W. D., May, 1923, *La Cruz 3983*.

The latter collection was once determined by the writer as *F. paraensis* Miq., to which the present species is related.

Ficus erratica Standl., sp. nov. Subg. *Urostigma*. Arbor omnino glabra, ramulis gracilibus 3–5 mm. tantum crassis, internodiis brevibus; stipulae caducae brunnescentes triangulari-lanceolatae 12–18 mm. longae (vel ultra?) longe anguste attenuato-acuminatae; folia modica petiolata in sicco subcoriacea, petiolo crasso 8–17 mm. longo; lamina elliptico-oblonga vel interdum obovato-oblonga, 8.5–15 cm. longa 4–7 cm. lata, abrupte acuta vel breviter cuspidato-acuminata, basin versus paullo angustata, basi ipsa acuta vel obtusa, fere concolor, costa supra fere plana, nervis prominulis, costa subtus prominente crassiuscula, nervis lateralibus utroque latere ca. 12 angulo lato divergentibus rectis teneris, prope marginem in nervum collectivum irregulare arcuato-conjunctis, venulis pallidis prominulis arcte reticulatis; pedunculi geminati graciles 3–4 mm. longi, minutissime puberuli vel glabri; involucrum bilobum patens 3.5 mm. latum, lobis apice rotundatis; receptacula globosa 6–7 mm. diam., basi et apice late rotundata, ostiolo paullo prominente.

TYPE: epiphytic tree 15 m. high, 15 cm. diam., leaves leathery, pale beneath, fruit pink to red, *Manicaria* swamp forest fringe, Mabaruma, Aruka River, N. W. D., British Guiana, March 23, 1945, *Fanshawe 2436;* vernacular name Komakaballi. Chicago Natural History Museum; New York Botanical Garden. BRITISH GUIANA: Malali, Demerara River in 1922, *La Cruz 2639*. SURINAM: weak slender tree or liana, dense *Clusia* bush 2 km. west of Last Ridge, Tafelberg, 786 m., *24563*.

Ficus Fanshawei Standl., sp. nov. Subg. *Urostigma*. Arbor alta, ramulis ca. 5 mm. crassis brunnescentibus, internodiis brevibus, novellis sparse pilis longis pallidis patentibus hirsutis; stipulae caducae, bene evolutae non

visae, in alabastris late ovato-triangulares 8 mm. longae longiacuminatae dorso brunneo-pilosae; folia modica petiolata membranaceo-coriacea, petiolo crasso 12–25 mm. longo brunneo-piloso vel glabrato; lamina elliptica vel oblongo-elliptica 10–16.5 cm. longa 4.5–8 cm. lata, apice acuta vel obtusa vel rotundata et breviter apiculata, interdum rotundata, base rotundata vel late obtusa, costa supra prominente, nervis tenerrimis prominulis, supra ad costam nervosque puberula vel glabrata, subtus pallidior, ad costam nervosque sparse pilosa vel puberula, serius glabrata, costa elevata, nervis lateralibus utroque latere ca. 8 angulo lato adscendentibus arcuatis, juxta marginem arcuato-conjunctis teneris, venulis prominulis laxe reticulatis; pedunculi geminati crassi vix ultra 3 mm. longi brunneo-pilosi; involucrum bilobum 3 mm. latum sparse brunneo-pilosum; receptacula globosa immatura 8–10 mm. longa, minutissime denseque puberula, ostiolo prominente annuliformi 2.5–3 mm. lato 1 mm. alto.

TYPE: epiphytic tree 15 m. high, 30 cm. diam., leaves thinly leathery, clustered at ends of branches, young fruit pale green, with paler dots, with membranous crown, edge of *Euterpe* swamp by roadside, Mabaruma, Aruka River, N. W. D., British Guiana, March 6, 1945, *Fanshawe 2363;* vernacular name Komakaballi. Chicago Natural History Museum; New York Botanical Garden.

FICUS GIGANTEA H.B.K. BRITISH GUIANA: epiphytic tree 9 m. high, the trunk 10 cm. diam., latex whitish, young fruit ovoid, green with paler dots, *Manicaria* swamp forest fringe, Mabaruma, Aruka River, N. W. D., *F2433*, vernacular name Komakaballi. Venezuela, Colombia (?).

There is some uncertainty regarding the determination of this collection, but the British Guiana tree is at least so close to the species named that it is unsafe to propose it as new.

FICUS GLAUCESCENS (Liebm.) Miq. BRITISH GUIANA: tree to 30 m. high, the buttresses 3.5–4.5 m. high, frequent, lateritic soil, mixed forest, White Creek, Essequibo River, *22877*. Mexico and Central America; Colombia to northern Brazil.

Ficus Maguirei Standl., sp. nov. Subg. *Urostigma*. Arbor interdum epiphytica, ramulis ca. 6 mm. diam., pilis longis laxis patentibus dense hirsutis vel pilosis, internodiis brevissimis plerumque multo minus quam 1 cm. longis; stipulae longe persistentes fusco-brunneae lanceolato-triangulares vulgo 1.5–2 cm. longae, longiatenuatae, extus dense adpresso-pilosae, intus glabrae; folia modica coriacea breviter petiolata, petiolo crasso 7–12 mm. longo dense piloso; lamina anguste oblonga vel oblanceolato-oblonga 8.5–14 cm. longa 2.5–4.5 cm. lata, breviter subabrupte acuminata, acumine obtuso, basin versus angustata, basi ipsa obtusa et subemarginata, supra in stato adulto glabra vel glabrata, ubique minute puncticulata, in sicco fuscescens, costa nervisque impressis, nervulis obsoletis, subtus paullo pallidior brunnescens, ad nervos costamque pilosa serius glabrata, costa crassiuscula elevata, nervis lateralibus utroque latere ca. 10 adscendentibus arcuatis elevatis prope marginem prominente arcuato-conjunctis, venulis prominentibus vel prominulis arcte reticulatis; receptacula arcte sessilia geminata globosa glabra 8–9 mm. diam., ostiolo majusculo prominente; involucrum bilobum arcte adpressum ca. 5 mm. latum, extus dense adpresso-pilosum.

TYPE: rare tree 10 m. high, 30 cm. diam., fruit black, splotched with green, *Dicymbe* forest, Tukeit, Potaro River Gorge, British Guiana, May 17,

1944, *Maguire & Fanshawe 23528.* Chicago Natural History Museum; New York Botanical Garden.

FICUS MALACOCARPA Standl. BRITISH GUIANA: epiphytic tree 6 m. high, the trunk 10 cm. in diam., with spreading crown, latex watery, white, leaves clustered at ends of branches, fruit greenish, dotted with brown and white, fringing a *Manicaria* swamp, Mabaruma, Aruka River, N. W. D., *F2386.* Known only from British Guiana, where collected several times.

Ficus Manicariarum Standl., sp. nov. Subg. *Urostigma.* Arbor, ramulis ca. 5 mm. crassis, internodiis brevibus, dense puberulis; stipulae caducae lanceolato-triangulares longiacuminatae fere 2 cm. longae extus minute puberulae; folia modica longipetiolata subcoriacea, petiolo gracili vel crassiusculo 1.5–3.5 cm. longo minute puberulo; lamina elliptica vel late elliptica 11–14 cm. longa 6–8 cm. lata, abrupte breviterque cuspidato-acuta, basi late rotundata, supra glabra, costa plana, nervis lateralibus pallidis vix prominulis, subtus pallidior, ubique minute brunneo-puberula, costa gracili elevata, nervis lateralibus utroque latere ca. 9 angulo paullo latiore quam semirecto adscendentibus, fere rectis, prope marginem irregulariter arcuato-conjunctis, venulis prominulis laxe reticulatis; pedunculi geminati crassi vix ultra 2 mm. longi; involucrum 5 mm. latum bilobum, extus minute puberulum, patens vel reflexum, lobis apice rotundatis; receptacula globosa 13 mm. diam. glabra vel glabrata, basi et apice rotundata, ostiolo vix elevato 3 mm. lato.

TYPE: epiphytic tree 12 m. high, 15 cm. in diam., latex white, leaves leathery, fruit green, soft, *Manicaria* swamp forest fringe, Mabaruma, Aruka River, N. W. D., British Guiana, March 23, 1945, *Fanshawe 2434;* vernacular name Komakaballi. Chicago Natural History Museum; New York Botanical Garden.

FICUS MARTINI Miq. SURINAM: strangler, fruit sweet, succulent, red, the pulp red, riverside en route to Pakka Pakka, Saramacca River, *23962.* French Guiana.

Ficus mensalis Standl., sp. nov. Subg. *Urostigma.* Arbor glabra, ramulis 4–5 mm. crassis, apicem versus foliatis; stipulae caducae, non visae; folia parva petiolata coriacea rigida, petiolo crasso 9–12 mm. longo; lamina obovato-elliptica vel oblongo-elliptica 6–9.5 cm. longa 2.7–4 cm. lata, subabrupte acuta vel acuminata, acumine obtuso vel acuto, basi acuta vel subobtusa, supra lucida, costa nervisque prominulis, venulis obsoletis, subtus concolor, costa crassa prominente, nervis lateralibus utroque latere ca. 10 angulo recto patentibus teneris fere rectis, juxta marginem in nervum collectivum conjunctis, venulis prominulis inconspicuis laxe reticulatis; pedunculi geminati 3 mm. longi; involucrum bilobum vix ultra 2.5 mm. latum patens, lobis apice rotundatis; receptacula globosa glabra 5–6 mm. lata, basi et apice late rotundata, ostiolo vix 2 mm. lato plano.

TYPE: diffuse tree overhanging escarpment, the trunk 20 cm. in diam., fruit red, 2 km. south of East Ridge, alt. 920 m., Tafelberg, Surinam, September 1, 1944, *Maguire 24584.* Chicago Natural History Museum; New York Botanical Garden.

Ficus pakkensis Standl., sp. nov. Subg. *Urostigma.* Arbor, ramulis 6–7 mm. crassis dense minuteque puberulis, internodiis brevibus; stipulae (bene evolutae non visae) ovato-triangulares, caducae, 1 cm. longae vel ultra, longiacuminatae, extus dense puberulae; folia modica longipetiolata coriacea,

petiolo crasso 2.5–4 cm. longo minute puberulo; lamina oblonga vel ellipticooblonga 10–16 cm. longa 4.5–6.5 cm. lata, apice rotundata, basi anguste rotundata et saepe emarginata, supra glabra, minute pallido-puncticulata et tactu asperula, costa plana, nervis vix prominulis, subtus fere concolor, ubique minute puberula, costa crassiuscula prominente, nervis lateralibus utroque latere ca. 8 angulo lato adscendentibus fere rectis juxta marginem inaequaliter arcuato-conjunctis, venulis prominulis arctissime reticulatis; pedunculi geminati ca. 8 mm. longi minute puberuli; involucrum bilobum ca. 4 mm. latum patens vel subreflexum minutissime puberulum; receptacula globosa vel obovoideo-globosa 14–16 mm. alta, basi rotundata, minute puberula, apice late rotundata, ostiolo paullo elevato fere plano.

TYPE: tree, riverside en route to Pakka Pakka, Saramacca River, Surinam, June 24, 1944, *Maguire 23960*. Chicago Natural History Museum; New York Botanical Garden.

This species is remarkable for the close reticulation of the lower leaf surface, the veinlets being so enlarged that they almost completely cover the leaf tissue.

Ficus paludica Standl., sp. nov. Subg. *Urostigma*. Arbor alta, ramulis gracilibus ca. 4 mm. crassis minutissime puberulis, internodiis brevibus; stipulae caducae lanceolato-triangulares 1.5 cm. longae (et ultra?) longe angusteque attenuato-acuminatae brunneae extus minute puberulae; folia majuscula longipetiolata crasse membranacea, petiolo gracili 3.5–4.5 cm. longo fere glabro; lamina ovalis vel late ovato-ovalis ca. 15 cm. longa et 9–10.5 cm. lata, apice rotundata vel obtusa et obtuse breviter apicata, basi late atque breviter cordata, utrinque saltem in statu adulto glabra, supra in sicco fusco-viridis, costa plana, nervis vix prominulis, subtus concolor, costa crassiuscula prominente, nervis lateralibus utroque latere ca. 10 teneris angulo fere semirecto divergentibus, fere rectis, juxta marginem laxe arcuato-conjunctis, venulis prominulis laxe reticulatis; pedunculi geminati vix 2 mm. longi et aequilati; involucrum 6 mm. latum bilobum patens minutissime puberulum; receptacula globosa 1 cm. diam. basi et apice rotundata, minutissime puberula vel glabrata, ostiolo 2 mm. lato paullo elevato.

TYPE: infrequent tree 20 m. high, 30 cm. diam., edge of swamp, open scrub land, second growth, bordered by swamps and marshes, Charlesburg Rift, 3 km. north of Paramaribo, Surinam, April 8, 1944, *Maguire & Stahel 22790*. Chicago Natural History Museum; New York Botanical Garden.

FICUS PRINOIDES Humb. & Bonpl. SURINAM: frequent, small tree, receptacles white dotted with green or brown, river banks above Kwatta hede, *23928*. Colombia to Venezuela and Surinam.

Ficus savannarum Standl., sp. nov. Subg. *Urostigma*. Arbor epiphytica, omnino glabra vel in partibus novellis minutissime puberula, ramulis ca. 4 mm. crassis, internodiis brevibus; stipulae caducae, bene evolutae non visae, 7 mm. longae et ultra, acuminatae; folia modica longipetiolata subcoriacea, petiolo crasso 2–3 cm. longo; lamina elliptica 10–12.5 cm. longa 5.5–6.5 cm. lata, abrupte cuspidato-acuminata, basi subacuta usque subrotundata, sat dense papilloso-punctata, costa supra plana, nervis vix prominulis, costa subtus prominente, nervis lateralibus utroque latere ca. 9 angulo lato divergentibus fere rectis, prope marginem inaequaliter arcuato-conjunctis, venulis prominulis laxe reticulatis; pedunculi geminati crassi ca. 4 mm. longi, involucro bilobo ca. 3.5 mm. lato, lobis apice rotundatis patentibus; recepta-

cula globosa 13 mm. diam. basi et apice rotundata glabra, ostiolo insigniter elevato crateriformi, medio depresso, 4 mm. lato, foliolis prominentibus convexis.

TYPE: epiphytic tree 7 m. high, the trunk 15 cm. in diam., copious latex, fruit green, globose, rare, edge of high forest, British Guiana, *Maguire & Fanshawe 23292.* Chicago Natural History Museum; New York Botanical Garden.

FICUS VELUTINA Willd. SURINAM: tree, vicinity of Posoegronoe, Saramacca River, *24039.* Central America, Colombia, Venezuela.

The determination of the Surinam collection is somewhat questionable, but it has been impossible to refer it satisfactorily elsewhere, and it seems inadvisable to describe it as new until this particular group of *Ficus* has been studied more thoroughly.

OGCODEIA GUIANENSIS Mildbr. BRITISH GUIANA: tree to 20 m., the trunk 20 cm. in diam., creamy latex, fruits 5 cm. long, mixed forest, Kamuni Creek, Essequibo River, *22947.* Known only from British Guiana.

Olmedia asperula Standl., sp. nov. Arbor gigantea, ramulis gracilibus vix 4 mm. crassis, dense puberulo-tomentellis, internodiis abbreviatis; stipulae bene evolutae non visae, in alabastris lanceolato-ovatae acuminatae 6 mm. tantum longae, dense adpresso-pilosulae, caducae; folia modica breviter petiolata coriacea, petiolo crasso 6–10 mm. longo dense pilis flavidis adpresso-pilosulo; lamina oblonga vel anguste oblonga 8–15 cm. longa 4–5.5 cm. lata, apice rotundata vel obtusa atque abrupte breviter acuminato-apiculata, basi obtusa vel anguste rotundata et saepe inaequilateralis, supra in sicco fuscescens, ubique scaberula, tactu asperula, ad costam dense minuteque hispidula, nervis non elevatis, subtus pallidior brunnescens, ubique dense puberula vel fere minute hispidula, costa elevata, nervis lateralibus utroque latere ca. 12 angulo lato adscendentibus, subarcuatis, gracilibus, juxta marginem inaequaliter arcuato-conjunctis, venulis elevatis et arctissime reticulatis; pedunculi axillares vel ad nodos defoliatos fasciculati ca. 8 mm. longi graciles dense puberuli; capitula mascula depresso-globosa 7 mm. lata multiflora; bracteae exteriores numerosissimae gradatim imbricatae, ovatae vel late ovatae, acutiusculae, extus dense minute puberulae

TYPE: tree 30 m. high, the trunk 30 cm. in diam., with thick brittle bark and palest yellow gummy latex; sapwood yellow, the heartwood dark chestnut with black markings like Tibikushi, tree has scent of almond essence, greenheart bush on brown sand, Moraballi Creek, Essequibo River, alt. 45 m., British Guiana, November 26, 1938, *Fanshawe 148.* Chicago Natural History Museum; New York Botanical Garden.

POUROUMA GUIANENSIS Aubl. BRITISH GUIANA: tree 18 m. high, 30 cm. diam., with buttresses to 2 m. tall, Takutu Creek to Puruni River, Mazaruni River, *F2050;* vernacular name Burume.

PROTEACEAE[42]

PANOPSIS SESSIFOLIA (Rich.) Sandwith. BRITISH GUIANA: tree 6 m. high, 20 cm. diameter, leaves whorled, fruit globose, green, buoyant, pithy, pendent, 1–6 per spike, riverside above Kaiatuk, Kaieteur Gorge, Potaro River, *23372;* 40′ tree, 8″ diameter, leaves herbaceous, flowers in terminal

[42] A. M. W. Mennega.

spikes, thickly clustered, pink, corolla lobes ligulate, whitish with an inner flap, Moraballi Creek, Essequibo River, *F304*. Rain-forest, southern Venezuela to Brazil.

LORANTHACEAE

ORYCTANTHUS BOTRYOSTACHYS Eichl. BRITISH GUIANA: parasitic on *Anacardium*, Garraway Stream, Potaro River, *22996*. Widely distributed in rain-forests, Colombia, Venezuela, and French Guiana to Peru, Bolivia and Brazil.

ORYCTANTHUS FLORULENTUS (Rich.) Urban. SURINAM: parasitic on *Bellucia grossularioides* (L.) Triana, Pakka Pakka, Saramacca River, *23972;* Savanna II, Tafelberg, *27202*. Colombia and the Guianas to Peru and Brazil.

PHORADENDRON CRASSIFOLIUM Eichl. BRITISH GUIANA: leaves yellow-green, flowers yellowish, fruit 4 mm. diameter, pale orange, Kaieteur Plateau, *23136;* epiphyte in secondary mixed forest, leaves fleshy, flower spikes yellowish, fruit oblong, pulpy, orange, Moraballi Creek, Essequibo River, *F1334*. SURINAM: parasite on *Bellucia grossularioides* (L.) Triana, growing with *Oryctanthus florulentus* (Rich.) Urban and *Phthirusa pyrifolia* (HBK.) Eichl., Pakka Pakka, Saramacca River, *23974*. Central America: British Honduras and Costa Rica; South America: Venezuela and the Guianas to Brazil, Bolivia and Peru.

Phoradendron Fanshawei Maguire, sp. nov. *Paradoxae*, *Fendlerianae*. Frutex parasiticus, dichotome ramosis; cataphyllis 3 per nodis; foliis crassis, obovatis; spicis cum 3–4 nodis, floribus 6-serratis.

Dichotomously branched, the branches thick, terete, minutely muriculate, swollen below the nodes, internodes 4–6 cm. long; cataphylls ca. 2 mm. long, 3 pair, sterile, obtuse, broadly triangular-connate for more than half their length, the first pair basal, the uppermost just above the midpoint of the node; leaves opposite, mostly 5.0–7.5 cm. long and 3.0–3.5 cm. broad, obovate-oblanceolate, coriaceous, drying minutely verruculose and rugulose, obscurely or not visibly basinerved, the apex rounded, the blade cuneate from about the middle, passing into a broad petiole 2–3 mm. long or subsessile; apparently dioecious, spikes axillary, solitary or several, usually 3–4 cm. long, bearing 3 pairs of cataphylls and 3–4 floriferous, clavate nodes, peduncles ca. 1 cm. long; flowers 3 or mostly 4 in 6 vertical series, hence ca. 24 per joint, conspicuously sunk into the axis, yellow, trimerous; fruit unknown; staminate plant unknown.

TYPE: epiphyte on *Terminalia*, Potaro River Gorge below Tukeit, British Guiana, May 16, 1944, *Maguire & Fanshawe 27201*. New York Botanical Garden; isotype at Kew.

Most closely related to *P. Fendlerianum* Eichler of the *Paradoxae*, from Venezuela, *P. Fanshawei* differs most conspicuously in its obovate-oblanceolate, cuneate blades, subsessile or with petioles 2–3 mm. long, rather than "Leaves round-ovate or elliptical, sometimes oblique, very obtuse, or emarginate, . . . rather abruptly petioled for some 10 mm."

PHORADENDRON JENMANI Trelease. BRITISH GUIANA: growing on *Norantea guianensis* Aubl., flowers greenish-yellow, occasional, Kaieteur Plateau, *23134*. Known only from British Guiana.

PHORADENDRON RACEMOSUM Northrop. SURINAM: parasitic in large tree, high mixed forest, south rim Arrowhead Basin, Tafelberg, *24655*. Widely

distributed in tropical America, according to Trelease from the upper West Indies, Venezuela and the Guianas.

PHORADENDRON ZULOAGAE Trelease. SURINAM: parasitic on small trees, fruit orange, White Rock Rapids, below Posoegronoe, Saramacca River, *24008*. Infrequently collected, Trinidad, Venezuela, and now Surinam.

Phthirusa adunca (Meyer) Maguire, comb. nov. *Loranthus aduncus* Meyer, Prim. Fl. Esseq. 149. 1818; *L. paniculatus* H.B.K. Nov. Gen. & Sp. **3**: 422. 1820; *L. conduplicatus* H.B.K. op. cit.; *L. Theobromae* Willd. ex R. & S. Syst. **7**: 132. 1829; *Struthanthus aduncus* (Meyer) G. Don. Gen. Syst. **3**: 414. 1834; *Phthirusa Theobromae* Eichl. in Mart. Fl. Bras. 5^2: 56. 1868; *P. paniculata* Macbr. Field. Mus. Bot. **11**: 17. 1931; *Struthanthus aduncus* (Meyer) G. Don. in Macbr. Fl. Peru, Field Mus. Publ. Bot. 2^2: 411. 1937. BRITISH GUIANA: parasite on *Anacardium*, Garraway Stream, Potaro River, *22995*. Widespread in much of tropical South America; Colombia, Venezuela, Trinidad, the Guianas, Brazil, Bolivia, and Peru. Maintenance of the Genus *Phthirusa* makes the above combination necessary.

PHTHIRUSA ANGULATA Krause. BRITISH GUIANA: flowers pale cream, fruit red, frequent, parasitic on lime tree, Mazaruni Forest Station, Mazaruni River, *23578*. Described from the Coppenam River, Surinam, the species is now known apparently from British Guiana and Dutch Guiana (Surinam). It is probably most closely related to *P. pyrifolia* which it simulates in general habit and reflected fruits, but differs in angled, glabrous branches rather than scurfy, terete branches in *P. pyrifolia*.

PHTHIRUSA PHAEOCLADUS Eichl. *Struthanthus phaeocladus* (Eichl.) Macbr. BRITISH GUIANA: frequent epiphyte on low trees, branches red, leaves pale brownish-red, fruit pale orange, Kaieteur Savanna, *23278*. It would seem not unlikely that the above, *Phthirusa guyanensis* Eichl. and *P. santaremensis* Eichl. are conspecific, and therefore all should come under the last name. *P. phaeocladus* in the restricted sense is apparently known from British Guiana, Peru and Brazil.

PHTHIRUSA PYRIFOLIA (H.B.K.) Eichl. SURINAM: growing on *Bellucia grossularioides* (L.) Triana with *Oryctanthus florulentus* (Rich.) Urban, and *Phoradendron crassifolium* Eichl., Pakka Pakka, Saramacca River, *23973*. Widespread in Central America and tropical South America.

PHTHIRUSA SQUAMULOSA Klotzsch ex Eichl. BRITISH GUIANA: epiphytic vine attached to host by haustoria, but rooted in the ground, tomentum dark brown, fruit purplish, rare, Kaieteur Savanna, *23194*. SURINAM: parasitic on *Licania crassifolia*, flowers red, fruit purplish, South Savanna, Zanderij I, *24972*. British Guiana, Surinam, and Pará.

Phthirusa savannarum Maguire, sp. nov. Ramis fusco-purpureis furfuraceis, glabrescentibus; laminis foliarum coriaceis, late ovatis, elliptico-oblongis vel orbiculatis, venis obsoletis, subtus mediis nerviis marginibusque laminarum late fusco-purpureis; glomerulis axillaribus ternationibus; floribus hermaphroditis: petalis 6, rariter 5 vel 4; antheris sine appendicibus.

Scandent semi-parasite; branchlets angled, furfuraceous, soon becoming glabrous, dark brownish-purple, otherwise the plant completely glabrous; leaves opposite, blades coriaceous, broadly ovate, elliptic-oblong to orbicular, 1.2–2.5 cm. long, 1–2 cm. wide, veins obsolete, midrib broadly and sometimes irregularly pigmented, petioles angled, 2–3 mm. long, petioles, midrib, and leaf margins dark brownish-purple; glomerules axillary, ternations sessile;

flowers hermaphrodite or sometimes only staminate; calyculus 1.5 mm. long, triangular, carinate, the apex triquetrous, subulate, calyx shallowly lobed, ca. 0.5 mm. long; petals 6 (rarely 5 or 4), 1 mm. long, 0.3–0.4 mm. wide, oblong, deeply cucullate at the obtuse or acutish apex; filaments free, glabrous, slender with an expanded base, 0.2–0.3 mm. long, anther sacs ellipsoidal, pendent, ca. 0.25 mm. long, wholly separated by the connective that does not at all or barely projects apically as a low blunt appendage; style columnar; mature fruit unknown.

TYPE: semi-parasite on shrub, flowers yellowish-green, immature fruit green, leaves coriaceous, Savanna II, 565 m. altitude, Tafelberg, Surinam, September 12, 1944, *Maguire 24702*. New York Botanical Garden.

Phthirusa savannarum belongs to the species group with ternations in axillary glomerules, therefore is related to *P. micrantha* Eichl, *P. Myrsinites* Eichl., and *P. monetaria* Sandw. Our species is distinctive by its coriaceous, veinless, broadly rounded leaves with pigmented margins and midrib, subulate calyculus, and non-appendiculate anthers.

Phthirusa Sandwithii Maguire, sp. nov. Ramis furfuraceis, fuscis; laminis foliorum subcoriaceis, oblanceolatis, apiculatis aliquando retusis, 5–7-nerviis; glomerulis axillaribus, ternationibus sessilibus; floribus hermaphroditis, petalis 4; staminibus adnatis, antheris 4-lobis; stylis clavatis.

Scandent, semi-parasite; branchlets furfuraceous, fuscous, becoming glabrous and ribbed (when dry); leaves opposite, subopposite, or alternate, the blades 2.0–3.5 cm. long, 1.2–1.8 cm. broad, oblanceolate, the apex rounded or retuse, minutely apiculate, faintly 5–7-nerved above, the midrib more or less prominent and fuscous on the under surface, subcoriaceous, the margins narrow, likewise pigmented, petioles 2–3 mm. long, ribbed; glomerules axillary, ternations sessile; flowers hermaphrodite; calyculus scurfy, subcarinate, triangular, acutish or obtuse, ca. 2 mm. long; calyx ca. 0.75 mm. long with low broad lobes; petals 4, oblong, 1.5–1.7 mm. long, hardly cucullate; stamens completely adnate to the petals, the anthers 4-lobed, without appendages; style clavate, 0.75 mm. long; fruit unknown.

TYPE: parasitic on small bushes on rocky ground near the Falls, leaves brownish-green, flowers greenish-yellow, Kaieteur Savanna, British Guiana, 1200 feet altitude, September 6, 1937, *Sandwith 1404*.

Phthirusa Sandwithii is most closely related to *P. micrantha*, having fairly similar leaves and like that species in having 4-merous flowers, but the petals are oblong and 1.5 mm. long, rather than ovate and 1 mm. long; the stamens are completely adnate with broad swollen bases and the anthers 4-lobed by the sterilization of central tissue of each anther sac, rather than bilobed; and the styles are conspicuously clavate with an enlarged ellipsoid stigma rather than being essentially cylindric without enlarged stigmas.

PSITTACANTHUS CUCULLARIS (Lam.) Blume. SURINAM: parasitic on leguminous tree, flowers yellow, bracts red, fruits apparently turning red, frequent, Saramacca River, 7 hours above Posoegronoe, *24920*. Surinam to Brazil and Peru.

PSITTACANTHUS LASIANTHUS Sandw. BRITISH GUIANA: epiphyte with woody stock on trees, frequent, chiefly along rivers, leaves fleshy, glaucous, buds yellow, flowers scarlet, apically yellow, mixed forest, Kaieteur Plateau, near summit of trail to Tukeit, *23077*. Known only from the Kaieteur Plateau, and White Side River, British Guiana.

STRUTHANTHUS DICHOTRIANTHUS Eichl. BRITISH GUIANA: parasite on lime tree, Mazaruni Forest Station, Mazaruni River, *23577;* data same as preceding, *F774.* Rain-forests, Colombia, Venezuela, Trinidad, British Guiana, Brazil and Peru.

OLACACEAE[43]

HEISTERIA CAULIFLORA Sm. SURINAM: frequent, scattered, shrub, sepals red, Campo Dungeoman, Saramacca R., *24056;* frequent, shrub to 3 m., flowers white, calyx at length expanded and scarlet, dakama forest, bottom of Arrowhead Basin. 515 m., Tafelberg, *24618;* infrequent, shrub to 3 m. high, calyx orange, montane forest, between Camps 3 and 4, Coppename R. headwaters, *24161.* Throughout Guiana.

HEISTERIA IQUITENSIS Sleumer. BRITISH GUIANA: tree 40–50 ft. high, 8 inch. diam., calyx pink, mora and mixed forest, Kamuni Creek, Groete Creek, Essequibo R., *22914;* occasional, 4 m. tree, 3 cm. diam., calyx inflated, crimson, fruit white, from low bush by stream, Kaieteur savanna, *23389.* Amazonas, eastern Peru. New to British Guiana.

HEISTERIA DENSIFRONS Engl. BRITISH GUIANA: occasional, tree to 15 m. high, 15 cm. diam., flowers small, white, fruit and calyx orange; rocky lateritic soil from dolerite dyke, Garraway stream, Potaro R., *22980.* New to British Guiana; hitherto only known from Amazonian Brazil. I was able to compare the above with a duplicate type preserved in the Leiden herbarium.

HEISTERIA SCANDENS Ducke. SURINAM: rope; flowers white, in *24856;* mixed wallaba forest, hill south of camp 3, km. 10, Coppenam R. headwaters, *24859.* Amazonian district, Guiana. Apparently only in the interior of Surinam.

The following key may be offered for the *Heisteria* species of Guiana:

1. a. Vine, fruiting calyx reflexed; throughout Guiana. *H. scandens* Ducke.
2. a. Fruiting calyx surpassing the fruit, deeply 5-lobed, red, at last expanded, 4–5 cm. diam., sepals during flowering nearly free ..... 3.
   b. Fruiting calyx much shorter than the fruit, calyx during flowering shortly 5-dentate ..... 4.
3. a. Leaves oblong to lanceolate-oblong, 12–25 cm. × 3–7 cm., in sicco smooth beneath; throughout Guiana. *H. cauliflora* Sm.
   b. Leaves elliptical, 7–14 cm. × 3.7 cm., in sicco distinctly rugose beneath; British Guiana. *H. iquitensis* Sleum.
4. 3. Pedicels 5 mm. long, fruiting calyx with rounded lobes, at last expanded, 1–1½ cm. in diam.; Surinam. *H. surinamensis* Amsh.
   b. Flowers subsessile or very shortly pedicellate ..... 5.
5. a. Fruiting calyx developed as a 5-dentate short cup, enclosing the lower part of the fruit; British Guiana. *H. densifrons* Engl.
   b. Fruiting calyx developed as a narrow rim at the base of the fruit; French Guiana, Surinam. *H. microcalyx* Sagot.

BALANOPHORACEAE

HELOSIS CAYENNENSIS (Sw.) Spreng. BRITISH GUIANA: apparent saprophyte on leaf-mold, Potaro River Gorge, 1 mile below Kaieteur Falls, *23524.* Root parasite, or possibly saprophytic, dense rain-forests, Colombia, Venezuela to Martinique and Trinidad, and the Guianas, possibly also in Central America.

[43] By G. J. H. Amshoff.

POLYGONACEAE

Coccoloba conduplicata Maguire, sp. nov. Sect. *Campderia* Lindau. Frutex subscandens; ramulis siccitate fusco-cinereis, angulatis, puberulentibus, sparse punctatis, ochreis membranaceis, apicibus obliquis, obtuso-acutis; foliis lanceolatis, obtusis vel acutis, conduplicatis, venulis reticulatis, subtus sparse punctatis; racemis terminalibus, juvenalibus puberulentibus, sparse punctatis, nodis 1–3-floribus; perianthiis stipitatis, segmentis oblongo-obovatis, obtusis; fructibus biconicis vel bipyramidalibus, perianthii lobis accrescentibus.

Shrub 2–4 m. high, frequently weak or scandent, branches gray-brown, when dry angled, sparsely puberulent and punctate; ochrea membraneous, 3–5 mm. long, oblique, the apex obtuse to acutish; blades lanceolate, glabrous, entire, 3–7 cm. long, 1.2–3.0 cm. broad, becoming conduplicate at maturity or in drying, chartaceous, pinnately veined, with 3–5 pairs, prominently reticulate on both surfaces, more or less sparsely orange-glandular-punctate on the lower surface and on the 3–5 mm. long, puberulent petioles, the apex acutish; racemes 3–5 cm. long, terminal, the rachis striate in drying, puberulent and inconspicuously punctate, the nodes 1–3-flowered, bracts ca. 1 mm. long, triangular-ovate, obtuse, ciliolate; pedicels 1–2 mm. long, puberulent; flowers white, in anthesis 2–3 mm. long, the tube stipitate, nearly equaling the oblong-obovate, obtuse perianth segments; stamens 8–10, filaments slender, expanded from above the middle and connate toward the base, the anthers ca. 0.4 mm. long, 0.6 mm. wide, 4-lobed, versatile; styles 3; fruit 6–8 mm. long, broadly biconic or bipyramidal, the perianth lobes accrescent from above the middle, completely enclosing the matured ovary; seed reddish-brown, crustose, deeply 3-lobed, each lobe in turn deeply sulcate, saccate at the base, albumen copious, very white.

TYPE: shrub to 4 m. high, flowers white, fruit drying rust-colored, the single 6-lobed seed dark red-brown, frequent, open scrub-rock savannas, Savanna VIII, Tafelberg, Surinam, 776 m. altitude, August 22, 1944, *Maguire 24437*. Cotype: scandent vine, flowers white, frequent, Savanna II, Tafelberg, *Maguire 27205*. New York Botanical Garden.

Frequent and characteristic of rocky pygmy bush openings and the escarpment edge on Table Mountain. Known only from Tafelberg, *C. conduplicata* is at once recognized by its folded, chartaceous, reticulately-veined, punctate leaves. It holds this last character in common with *C.lepidota* A. C. Smith, and like it belongs to the section *Campderia* Lindau, but differing widely in habit, leaf form, and inflorescence.

COCCOLOBA GUIANENSIS Meissn. BRITISH GUIANA: liana 2–3 cm. diameter, in low tree in bush island, rare, Kaieteur Savanna, *23316;* scandent shrub, secondary mixed forest, fruit in terminal spikes, ovoid, purple-black, thinly fleshy, Mazaruni Station, *F1533*. British Guiana, the Guianas, and the Amazon Basin, Brazil.

COCCOLOBA MICROPUNCTA Eyma. SURINAM: rope with pink and white flowers, banks of Saramacca River above Kwatta hede, *23927; 23929*. Known previously only from the type, upper Surinam River near Goddo, *Stahel 77*.

TRIPLARIS SURINAMENSIS Cham. SURINAM: tree 25 m. tall, 30 cm. diameter, pistillate flowers greenish-white, the lobes becoming pink, frequent in openings, Toekoemoetoe Creek near confluence with Saramacca River, *24914;*

with data as in preceding but from a staminate tree, *24915*. Apparently not uncommon in rain-forests of the Guianas and Amazonian Brazil; poorly separated from specimens passing as *T. americana* L.

NYCTAGINACEAE

BOERHAAVEA COCCINEA Mill. *B. paniculata* Rich. SURINAM: weed in open sandy places, Charlesburg Rift, 3 km. north Paramaribo, *22741*. Widely distributed weed in tropical America.

NEEA CONSTRICTA Spruce ex Schmidt. BRITISH GUIANA: tree 40 feet high, 6 inches diameter, from ropy forest, leaves thinly fleshy, glabrous, all parts brittle, flowers in terminal inflorescence, pink, fleshy, Takutu Creek to Purini River, Mazaruni River, *F2140* ♀; tree 20 feet high, 4 inches diameter, flowers in terminal cymose inflorescence, pale creamy, easily detached, corolla magenta-colored, lobes small, stamens inserted at base of tube, in white sand, wallaba bush, 50 miles, Bartica-Potaro Road, *F1435* ♂.

This last is apparently the only staminate specimen of the species known. The pistillate specimens are satisfactorily similar to the isotype of *N. constricta*, in vicinibus Santarem, Pará, July 1850, *R. Spruce* sine no., at the New York Botanical Garden. Previously known only from the type collection. Possibly conspecific with *N. constrictoides* Heimerl from Bogotá, Colombia.

NEEA aff. *cauliflora* Heimerl. BRITISH GUIANA: tree 50 feet high, 12 inches diameter, fruit in cymose fascicles on the stem, globose, emarginate, fleshy, cotyledons ruminate, mixed forest, Groete Creek, Essequibo River, *F1747*. This collection is probably to be referred to *N. cauliflora* Heimerl, represented by *Ule 9365* and *9365b* from Amazonas. Neither authentically named specimens nor adequate descriptions are available which would make it possible to fix the Fanshawe specimens with more certainty.

PISONIA GLABRA Heimerl. SURINAM: tree 12 m. tall, 20 cm. in diameter, southwest escarpment, Tafelberg, *24628*. Fairly closely matching the isotype (*Sandwith 553*) of *P. glabra* from British Guiana, the above collection is perhaps best assigned to this species. In addition to our plant and the type collection, represented by *Jenman 3978*, Upper Demerara River, British Guiana.

PISONIA OLFERSIANA Link, Klotzsch & Otto. BRITISH GUIANA: tree 30 feet high, 4 inches diameter, wood streaky yellow, brittle, wallaba forest, Moraballi Creek, Essequibo River, *F268;* tree 25 feet tall, 3 inches diameter, stamens exserted, filaments white, Waini River, N. W. D., *F2338;* same locality, pistillate plant, *F2347*. SURINAM: infrequent tree, 15 m. high, flowers inconspicuous, green, fruit purple, primary jungle, Charlesburg Rift, 3 km. north Paramaribo, *22793;* border of savanna, vicinity Mata, Zanderij I, *24955*. Widespread in rain-forests, Venezuela and Trinidad to southern Brazil and Bolivia.

PISONIA SALICIFOLIA Hiemerl. BRITISH GUIANA: Demerara River, *Jenman 3899;* Lamaka Dam, *A. W. Bartlett* sine no.; Georgetown, *Hitchcock 16683;* tree 20–30 feet tall, 3 inches diameter, fringe *Euterpe* swamp, Mabaruma, Aruka River, N. W. D., *F2378*. Known from Trinidad and British Guiana.

PHYTOLACCACEAE

PHYTOLACCA RIVINOIDES Kunth & Bouché. BRITISH GUIANA: weed in old field, Bunsika Creek, Aruka River, *F2450*. SURINAM: rank herb, flowers

white-pink, rachis bright purple-red, openings in high bush, base of north escarpment, Tafelberg, *24307*. Widely distributed in tropical America from Mexico and the West Indies through the Amazon Basin and Peru.

PORTULACEAE

PORTULACA PILOSA (?) L. SURINAM: frequent annual, herbage red, flowers white, shallow open sandy soil, islands in rapids between Grasi Falls and Posoegronoe, Saramacca River, *23996*.

CARYOPHYLLACEAE

DRYMARIA CORDATA (L.) Willd. BRITISH GUIANA: weed, Mazaruni Forest Station, Mazaruni River, *23562*. A pan-tropical weed.

NYMPHAEACEAE

NYMPHAEA RUDGEANA G. F. W. Meyer. BRITISH GUIANA: flowers white, locally common, floating in Potaro River backwater above the falls, Kaieteur Plateau, *23405*. SURINAM: abundant, backwater, Saramacca River, Kwakoegron, *25004*. Widely distributed in the West Indies and tropical South America.

MENISPERMACEAE [44]

ABUTA BULLATA Moldenke. BRITISH GUIANA: Potaro River below Tukeit, base of the Kaieteur escarpment, *23489;* occasional, rope with stem diameter of 4 cm., leaves stiff, chartaceous, staminate flowers green, fruit yellow, *23505*. The species is known only from Amazonas, Brazil, and British Guiana. The type collection and the only other previously known collection from British Guiana are also from the basin of the Potaro River. The flowers of the species were not known up to the time of the present collections and so are described herewith: staminate inflorescence: bractlets linear, about 1.5 mm. long, densely pubescent with appressed forward-pointing plainly visible hair; prophylla 2, oblong, about 1.5 mm. long and 0.7 mm wide, very concave on the inner face, densely appressed-pilose on the back, acute at apex; sepals 6, the 3 outer ones oblong, about 2 mm. long and 1 mm. wide, fleshy, very concave on the inner face, subacute at apex, appressed-strigose with microscopic hairs on the outer face, the 3 inner ones ovate-suborbicular, fleshy, about 1.8 mm. long and 1.5 mm. wide, rounded at apex, concave on the inner face, appressed-strigose with microscopic hairs on the outer face; stamens 6, about 1 mm. long, glabrous.

ABUTA KLUGII Moldenke. BRITISH GUIANA: tough black rope from secondary white sand forest, leaves leathery, stiff, brittle, flowers in axillary spikes, yellow-green, mostly in bud, Sandhills, Demerara River *F1214* (3950). British Guiana through Amazonas, Brazil to Loreto, Peru.

ABUTA OBOVATA Diels. BRITISH GUIANA: grey hardish rope 4 cm. diam., leaves stiffly leathery, inflorescence axillary, fruit oblong-ovoid, yellow, glabrous, pericarp thinly fleshy, stone wrinkled, embedded in translucent pulp, from crown of Kakaralli, 107 mile Bartica Potaro Road, *F1497* (4233). British Guiana, Bolívar, Venezuela, and Amazonas, Brazil.

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[44] By Harold N. Moldenke.

CHONDODENDRON CANDICANS (L. C. Rich.) Sandw. BRITISH GUIANA: rope from crown of *Talisia*, leaves glaucous below, fruit ovoid, green, mealy, endosperm white, Keriti Creek, Essequibo River, *F887* (3623). Known definitely only from British Guiana and Surinam; recorded from "Rio Acre, Peru."

CISSAMPELOS ANDROMORPHA P. DC. BRITISH GUIANA: woody vine, growing on a small tree in ropy forest, stem ½–1 cm. in diameter, leaves membranous, pruinose beneath, flowers cauliflorous, in delicate greenish fascicles of 2 or more together, male flowers greenish-white, petals erect-patent, disc whitish, cupular, stamens on an erect pedicel in center of flower, Takutu Creek to Puruni River, Mazaruni River basin, *F2066* (4802). The species is widespread in tropical America.

MYRISTICACEAE [45]

IRYANTHERA LANCIFOLIA Ducke. BRITISH GUIANA: tree 60 ft. high, 8 in. diam., from *Iryanthera* marsh forest, lvs. thinly leathery, supple, [staminate] flowers pale green, in short axillary spicate rusty-tomentose inflorescences, vernacular name *Kirikaua*, Kaituma River, 12 miles up, *F2410*. New to the Guianas. The cited specimen is referred with hesitation to a species previously known only from Amazonian Brazil and adjacent Peru, but the foliage and staminate inflorescences of our plant agree perfectly with those of material cited by me in Brittonia **2**: 449 (1938). The inflorescences are shorter than normal but are immature. A similar occurrence in the Northwest District of a typically Amazonian species of *Iryanthera* was noted in the case of *I. macrophylla* (Benth.) Warb. (op. cit. 430).

Possibly *F1272*, a sterile specimen from the Mazaruni Station, also represents *I. lancifolia*.

IRYANTHERA PARAENSIS Huber. BRITISH GUIANA: tree 50 ft. high, 6 in. diam., in mixed forest, vernacular name *Kirikaua*, Mazuruni Station, *F1384*. Known from a few other collections from British Guiana; also in Surinam, Amazonian Brazil, and adjacent Peru.

VIROLA SEBIFERA Aubl. BRITISH GUIANA: trees 30–60 ft. high, 2–10 in. diam., Mazaruni Station; *F534; F622;* Makauria Creek; *F581;* Forest Dept. *D398*. Widely distributed throughout tropical America.

VIROLA SURINAMENSIS (Rol.) Warb. SURINAM: frequently large tree to 40 m. high and 2 m. diam., buttresses spreading 6 m., pina swamp, km. 10.5, Coppenam River Headwaters, Surinam, *24853*. Locally abundant from the Lesser Antilles to the Guianas and eastern Brazil.

LAURACEAE [46]

In 1889, Mez published the most recent revision of the Lauraceae of South America. Since that time no one had made an extensive study of the family of this hemisphere until Dr. A. F. G. H. Kostermans began publishing in 1936. Dr. Kostermans had at his disposal most of the types necessary and examined thoroughly the literature of the group. His treatment of the

[45] By A. C. Smith.

[46] By Caroline K. Allen.

Lauraceae in Pulle's Flora of Surinam served as a basis for the present preliminary report.

PERSEA BENTHAMIANA Meissner. BRITISH GUIANA: tree 21 m. high, 35 cm. diam., with low buttresses, bark and wood with odor of pine resin, leaves stiffly coriaceous, pruinose beneath, inflorescences axillary spikes, flowers pale cream, perianth pubescent, stamens, style and ovary pubescent, marsh forest of Sacoglottis, Pouteria and Iryanthera, Kaituma River 12 miles up, *F2402* (5138). Reported from the Guianas and Brazil. One of the two wild species of *Persea* in this area.

OCOTEA RHYNCOPHYLLA Mez. BRITISH GUIANA: tree 30 m. high, 20 cm. diam., clumped, wood resembling that of Yellow Silverballi, leaves thinly coriaceous, glaucous beneath, inflorescences axillary many-flowered panicles, flowers creamy yellow, Clump-Wallaba forest, 107 mile, Bartica-Potaro Road, *F1514* (4250). Described from Brazil.

The inflorescences of the type-specimen are shorter, fewer-flowered than those of the number cited above, some of the branchlets of which seem to have suffered damage, perhaps from galls.

OCOTEA GUIANENSIS Aublet. BRITISH GUIANA: tree 18 m. high, 30 cm. diam., leaves chartaceous, silvery sericeous beneath, young fruit gray-green in axillary spikes, mature fruit in spikes below leaves, cupule greenish-brown, verruculose, shallow, hemispheric, fruit oblong, green, not quite ripe, "Kereti," secondary Kokerite forest on light brown sand, Ituni Road, Mackenzie, Demerara River, *F2483* (5219). Known from Guiana and Brazil. One of the most spectacular of the Lauraceae of this area, because of the bright sericeous under-leaf surface.

OCOTEA GUIANENSIS Aublet var. SUBSERICEA Kostermans. BRITISH GUIANA: tree to 27 m. high, 50 cm. diam., bark faintly aromatic, leaves coriaceous, rugose beneath, sericeous when young, indument indistinctly subsericeous in maturity, young fruit green, in panicles, cupules rugulose, "White Silverballi," Kautaballi forest, Ituni Road, Mackenzie, Demerara River, *F2478* (5214). Described by Kostermans from Surinam. The young fruits are almost entirely enclosed by the surrounding cupule, which brings to mind the characteristic fruits of the genus Aniba.

OCOTEA GLOBIFERA Mez. BRITISH GUIANA: tree 21 m. to 30 m. high, 20–25 cm. diam., trunk unbuttressed, but basally swollen, adult branchlets glabrous, grayish, leaves thickly chartaceous to leathery, elliptic to obovate, inflorescences terminal or axillary, spicate, aromatic, pistillate flowers pale cream, fruit globose, glossy, dark green, cupule black-brown, verruculose, "Pear-leaf Silverballi," "Shirua," mixed forest, on brown sand, possibly a secondary species, Mazaruni Station, *F767* (3503), *F1363* (4099). Heretofore reported only from French Guiana.

The specimens cited above bear soft, fine, subsericeous instead of sparse ferruginous pilose pubescence beneath on the midrib. Mez relates the species to *O. commutata.*

OCOTEA CANALICULATA (Richard) Mez. BRITISH GUIANA: tree large, 33 m. high, 40 cm. diam., unbuttressed, bark faintly scented, branchlets gray or ferruginous-tomentose, leaves oblong or elliptic-lanceolate to 14 cm. long, coriaceous, densely but sometimes obscurely areolate, glaucous beneath, inflorescences numerous, axillary, narrowly paniculate, branched, ferruginous-

tomentellous, branchlets pink, usually (see Kostermans) not more than 9 cm. long, but in the specimen cited below up to 15 cm., flowers and buds appearing bronze-green, perianth lobes pink, erect to spreading, "White Silverballi," "Hariraru," secondary Kautaballi forest, Mazaruni Station, *F651* (3387). Reported from Guiana, Trinidad and Northern Brazil.

The inflorescences are much shorter, and the flowers are pink rather than yellow. Otherwise the specimen cited matches the fragment of the type from Cayenne.

OCOTEA ? CARACASANA (Nees) Mez. BRITISH GUIANA: tree 25 m. high, 30 cm. diam., with low buttresses, branchlets ferruginous-tomentellous, becoming glabrous, brownish, angled, leaf-blade large (to 24 cm. long), coriaceous, brownish sericeous beneath decurrent and inrolled at the base up to 2 cm., above coarsely and somewhat prominently reticulate, shining, inflorescences numerous, pyramidal, equalling or shorter than leaves, tomentellous, flowers densely tomentellous, creamy, the lobes somewhat keeled, ovary pale green, Mora forest, siding a swamp, Mazaruni Station, "Baradan," *F631* (3367). Described from Venezuela.

The specimen cited above differs from the type and from supposedly authentic material from Venezuela, in having somewhat larger leaves with definitely brown-sericeous lower surface, instead of the ferruginous pubescence giving way later to a subglaucous condition. The inflorescences too are more brownish than ferruginous. If Fanshawe's number is not *O. caracasana*, its alliance is certainly with that species or group of species.

OCOTEA cf. *O. glomerata* (Nees) Benth. & Hook. BRITISH GUIANA: tree 18–30 m. high, 30–40 cm. diam., buttressed to 1.3 m., leaves glaucous beneath, rugose, coriaceous, inflorescences axillary, shortly branched, flower buds creamy-green, flowers withered, probably milk-white, outer surface of perianth, calyx-tube and flower spike pubescent, young fruit green, pubescent, oblong, crowned by withered flower, mature fruit purple-black, cupule brownish, mixed forest on brown sand, Turu bush, Moraballi Creek, Essequibo River, and Mazaruni Station, "Kurahara Silverballi," *F1306* (4042) and *F1979* (4715).

OCOTEA OBLONGA Mez. BRITISH GUIANA: tree 9–18 m. high and 15–20 cm. diam., leaves coriaceous, glossy, inflorescences paniculate, flowers downy, drooping when open, young fruit green, ovoid, glossy, young cupules obovate, 5-ribbed, green, narrowing into pedicel, mature cupule obconical, with small rim, brown-green, verruculose, mature fruit pale green, light-verruculose, seed whitish, forest near river bank, *F729* (3465); secondary mixed forest, Mazaruni Station, "Keriti," *F926* (3662). Known from French Guiana, also, and one collection reported by Mez from Trinidad; a single number of the Bang collection from Bolivia is noted as probably being this species.

The inflorescences of the above numbers seem to be more strict than pyramidate-paniculate as described by Mez and appear longer than the leaves. Possibly they do not belong to this species.

OCOTEA ? LAXIFLORA Mez. BRITISH GUIANA: shrub or small riparian tree to 6 m. high, 7.5 cm. diam., leaves thinly coriaceous, glabrous, shining above, long-acuminate to acuminate-caudate, elliptic, staminate inflorescences axillary, rather few-flowered, usually unilateral, flowers white, fragrant, Waini River by Big Kunali Creek, N. W. D., *F2333* (5069). Reported from Bra-

zilian Amazon, Venezuela, and Bolivia. Mez describes the flowers as yellow. The venation of the leaves from the type-material is more arcuate and less ascending.

OCOTEA ABBREVIATA Schwacke & Mez. SURINAM: small tree (low shrub, according to Schwacke & Mez), bark used as spice, leaves chartaceous, glabrous, olive-green and shining above, prominently reticulate throughout, margins recurved, staminate inflorescences short, few-flowered, flowers white, islands in rapids along river between Grasi Falls and Posoegronoe, Saramacca River, *24000;* pistillate inflorescences short, flowers whitish, fruit immature, primary jungle, near Posoegronoe, Saramacca River, *24018*. Described originally from the province of Rio de Janeiro, eastern Brazil.

Both localities have in common the low altitudes along the shore and rivers. Schwacke & Mez describe the bark of this tree as slightly aromatic, astringently and minutely stinging.

OCOTEA CAUDATA (Nees) Mez. BRITISH GUIANA: undergrowth shrub or small tree to 7–8 m. high, 5 cm. diam., branchlets reflexed, buds green, flowers yellow or pink,-in delicate axillary cymes, fruit oblong, green, cupule smooth, shining, crimson, pedicel crimson, much thickened, "Yellow Silverballi," "Yekuru," high secondary mixed forest, Kartabo Road, Mazaruni Cuquin District, *C. W. Anderson 48 A;* Mazaruni Station, *F503* (3239); Kamuni Creek, Groete Creek, Essequibo River, *22903*. Reported from British Guiana, Northern Brazil and possibly Bolivia.

Kostermans (Meded. Bot. Mus. Utrecht **25**: 16. 1936) mentions that possibly *O. urophylla* (Meissner) Mez is a variety of the above species. He also includes *O. marowynensis* Mez as a synonym. I suggest, also, that *O. punctulata* should be considered carefully as possibly conspecific. The latter species was described from fruiting material alone, collected in French Guiana. *O. caudata* and *O. urophylla* were collected in British Guiana and represent staminate and pistillate flowers respectively. *O. marowynensis* was described from a staminate flowering specimen of Surinam. In species with dioecious flowers, it is very difficult to state definitely that the different phases are conspecific, since there is usually a great deal of variation in this section of the genus.

OCOTEA NEESIANA (Miquel) Kostermans. SURINAM: small tree to 15 m. high, branchlets blackish, glabrous, leaves membranaceous to chartaceous, glabrous and more or less shining, apex long-acuminate, inflorescences short, somewhat branched, comparatively long-pedunculate, staminate flowers almost glabrous, sandy soil of old sea beach consisting of open scrub land, primary jungle bordered on both sides by swamps and marshes, Charlesburg Rift, 3 km. north of Paramaribo, Saramacca River, *22794*. Heretofore known only from Brazil. The flowers are reported to be yellow.

OCOTEA PUBERULA Nees. BRITISH GUIANA: tree (or shrub, fide Mez) 6–27 m. high, 5–40 cm. diam., bark and wood faintly aromatic, leaves chartaceous or subcoriaceous, reticulate, staminate inflorescences axillary, slender, paniculate, up to 8.5 cm. long, flowers pale yellow, pistillate inflorescences axillary and terminal, not longer than 2.5 cm. long, flowers whitish, young fruit ovoid, green, becoming globose, glossy, dark green with lighter dots, subtended by a green cupule, in part flushed red, like pedicels, "Shirua," river bank forest, sand hills, Demerara River, *F1231* (3967); "Keriti," Mazaruni Station, *F1277* (4013); secondary forest on lateritic

gravelly soil, Mabaruma, Aruka River, N. W. D., *F2428* (5164). Reported throughout tropical South America as far south as Argentina. Kostermans includes *O. Martiniana* Mez in the above species.

OCOTEA SCHOMBURGKIANA Mez. BRITISH GUIANA: tree to 24 m. (shrub to 2 or 3 m. high, according to Mez), leaves elliptic to broadly elliptic, coriaceous, loosely reticulate and shining above, more densely reticulate beneath, inflorescences axillary, sometimes up to 10 cm. long, usually less, staminate densely flowered, pistillate less so, flowers creamy white, very fragrant, fruit ovoid, acute, one-third covered by hemispheric, simple and entire-margined cupule, Wallaba forest, sand hills, Demerara River, *F906* (3642).

OCOTEA GLAUCINA (Meissner) Mez. SURINAM: tree to 18 m. high, 15 cm. diam., branchlets glabrous, somewhat slender, dark, leaves chartaceous-coriaceous, shining above, densely and prominently reticulate throughout, elliptic, acuminate or acute, about 12 cm. long, steep east-facing slopes, high forest, altitude 300 m., south of East Ridge, Tafelberg, *24548*. Described from Brazil.

The specimen cited above, although in fruit, matches very well the *Blanchet 3577* cited both by Mez and Meissner. The chief difference appears to be the more rounded leaf-base of the Brazilian specimen, and the less glaucous aspect of the lower-leaf surface of the Guiana collection. Both numbers show a peculiar phenomenon in that the tips of the uppermost (younger) leaves in each case are without reticulation on their upper half, more so on the upper surface than on the lower. This may have been occasioned by the specimens being placed too near the heat in drying or it may be due to a physiological factor inherent in the species.

NECTANDRA GRANDIS (Mez) Kostermans. BRITISH GUIANA: large tree up 30 m. high, 20 cm. diam., branchlets stout, angled, ochraceous-tomentellous, leaves shining above, glaucous beneath, midribs pale orange-brown, staminate flower buds ovate, mealy, gray, narrowed above center, corolla lobes pale or creamy yellow, anthers green, ovary yellow-orange, narrowed just below lobes, softly pubescent, Moraballi Creek, Essequibo River, altitude 60 m., "Buradié," *F130* (2739). Reported from French Guiana and British Guiana and questionably from Brazil by Kostermans. This striking tree is one of the two dioecious species of *Nectandra* reported from this region.

NECTANDRA PISI Miquel. BRITISH GUIANA: tree 3–12 m. high, 20–30 cm. diam., bark faintly aromatic, leaves rigidly coriaceous, margin incurved at base, somewhat shining above, puberulous to glabrescent beneath, often barbellate in axils, inflorescences terminal or axillary corymbose panicles, milk-white, perianth lobes almost woolly-tomentose, outer greenish, fruit ovoid, green, glabrous, cupule red, verruculose, "Shirua," "Yellow Silverballi," Bonasika Creek, Essequibo River, *C.W. Anderson 86;* Supenaam River, For. Dept. Brit. Guiana *999* (B 3); secondary mixed forest on loam, Groete Creek, Lower Essequibo River, *F1257* (3993); by creek-side, Sabaina Creek, Morebo Creek, Waini River, N. W. D., *F2350* (5086); leaning over Sebai Creek, Kaituma River, *F2422* (5158). Found in Guiana, in the Amazonian District. Kostermans (Meded. Bot. Mus. Utrecht **25**: 19. 1936) has segregated this species from Mez' *N. globosa* which is not known in Guiana.

Nectandra Maguireana Allen, nom. nov. *Nectandra amplifolia* Rusby, Descr. N. Sp. S. Am. Pl. 20. 1920, non Mez. SURINAM: tree to 25 m. high,

50 cm. diam., branchlets somewhat slender, pale ferruginous-tomentellous, becoming glabrous, leaves chartaceous, nerves and midrib prominent beneath, axils glandular, pubescent, inflorescence grayish tomentellous, flowers large, white, fragrant, Toekoemoetoe Creek, Saramacca River, *24071;* opening by Grace Falls, base of south escarpment, Arrowhead Basin, altitude 625 m., *24490;* high mixed forest, base of cliffs, west escarpment, altitude 420 m., *24688*. Described by Rusby from Santa Marta, Colombia, at an altitude of 1100 m.

There is a close relationship between this species and *N. Pisi* for the most part commonly known as *N. globosa* (see Kostermans in Meded. Bot. Mus. Utrecht **25**: 24. 1936), differing from the latter in the texture of the leaves and the presence of pubescence on the style.

NECTANDRA CUSPIDATA Nees. BRITISH GUIANA: tree to 30 m. high, 30 cm. diam., branchlets minutely ferruginous-brown tomentose presently becoming grayish, leaves coriaceous, lanceolate-acuminate, nerves ascendent, inflorescences full-flowered, spreading, panicles longer than leaves, fruits ellipsoid, green, becoming black, subtended by shallow cupule, secondary forest on loose brown sand, Mazaruni Station, "Shirua," *F713* (3449); "Silverballi called Keriti," Issororo Station, Aruka, For. Dept. Brit. Guiana *388*. Probably common throughout northern part of South America.

Mez included this species under *N. Pichurim,* which may be distinguished by the hemispheric cupule and the more numerous nerves of the leaves (see Kostermans, Meded. Bot Mus. Utrecht **25**: 21. 1936). There has been associated with these two entities the species *N. amazonum,* which bears flowers nearly twice as broad in diameter, and whose anthers are provided with well-defined connectives, and *N. urophylla,* also with larger flowers. *N. ambigua* as well, suggested by Kostermans as a possible variety of *N. Pichurim,* appears to have larger flowers than the species proper.

NECTANDRA LUCIDA Nees. BRITISH GUIANA: tree 12 m. high, 15 cm. diam., leaves thinly coriaceous, glabrous, finely reticulate, inflorescences axillary, up to 15 cm. long, peduncle up to 10 cm. long, flowers including anthers white, Takutu Creek to Puruni River, Mazaruni River, *F2089* (4825). Described from Guiana and the Alto Amazon region. The Fanshawe number is a match for the type of *N. Schomburgkii* which Mez has reduced under *N. lucida.*

ANIBA KAPPLERI Mez. SURINAM: tree to 13 m. high, 10 cm. diam., branchlets glabrous, covered with numerous small lenticels, leaves alternate, chartaceous or thinly chartaceous, glabrous, dull, inflorescences subterminal panicles, many flowered, ferruginous-tomentellous, flowers cream, rear of village, Jacob kondre, Saramacca River, *23887*. Known from Dutch and British Guiana.

The branchlets are rather more brownish than gray and the flowers are cream-colored rather than white or dull golden-yellow, as mentioned by Kostermans. The petioles seem to be heavily verruculose (owing perhaps to the presence of numerous lenticels?), a fact not mentioned by Kostermans.

ANIBA ROSAEODORA Ducke. BRITISH GUIANA: tree to 4 m. high, 4 cm. diam., buds golden, young branchlets rufo-ferruginous becoming fuscescent-tomentellous, leaves rigid-coriaceous, beneath pulverulent-tomentellous, yellowish to ferruginous-orange, inflorescences many-flowered, paniculate, fer-

ruginous-tomentellous, river side above Kaieteur Falls, Kaieteur Plateau, *23374*. Reported from the Amazon Basin, the Guianas, and Colombia.

The tree, according to Kostermans, reaches a height of 30 m. and is seemingly very common; whereas the number cited above is pronounced rare and not more than 4 m. high. The collectors do not mention the presence of an essential oil which is distilled from the species and used commercially. However, the specimen under discussion matches the species as it is understood by the author.

ANIBA EXCELSA Kostermans. BRITISH GUIANA: tree 18 m. high (to 35 m. fide Kostermans), 30 cm. diam., bark and wood sweetly aromatic, branchlets robust, rugose, densely ferruginous-tomentellous becoming grayish, glabrescent, buds densely ferruginous-velutinous, with large scales, leaves thick, coriaceous, ferruginous-tomentose beneath, blade decurrent on stout petiole, inflorescences terminal, ferruginous-tomentose, with greenish-cream tomentose flowers barely opening, mixed forest, "Greenheart Gale," Mazaruni Station, *F1362*. Known only from British Guiana.

Kostermans describes the inflorescences as being not more than 13 cm. long. The number cited above seems to agree with the original description in all but the length of the inflorescences, which is nearly 20 cm. The leaves of Maguire's collection are up to 10 cm. in width.

ANIBA HOSTMANNIANA (Nees). SURINAM: small tree or shrub, to 4 m., branchlets stout, sulcate, ferruginous-tomentellous, becoming glabrescent, with conspicuous lenticels, leaves subverticillate, coriaceous or rigidly coriaceous, inflorescences paniculate, subterminal, many-flowered, up to 25 cm. in length, flowers cream-colored, petals not expanding in anthesis, infrequent on river banks below rapids, Jacob kondre, Saramacca River, *23822, 23823*. Known from Surinam and the lower Amazon Basin.

ANIBA CANELILLA (H.B.K.) Mez. BRITISH GUIANA: tree (or shrub, rare, according to Kostermans) 30–33 m. high, 75 cm. diam., bark, wood and leaves all having strongly scented essential oil rather like cinnamon, branchlets slender, glabrous, gray, leaves chartaceous, elliptic-lanceolate, lanceolate or subobovate-lanceolate (according to Kostermans), inflorescences paniculate, few-flowered, short, flowers greenish white (yellowish-tomentellous, according to Kostermans), growing in high miscellaneous forest on steep slope, with reddish loamy sand soil, southern side of Kanuku Mts., right bank of Rupununi River near Sand Creek, altitude 330 m., "Ashmud", For. Dept. Brit. Guiana *2251* (D260). Known from the Amazonian District and from Venezuela and also in cultivation.

The flowers of the cited specimen are greenish white and the outer perianth-lobes are shorter than the inner, which is characteristic of the species.

ANIBA cf. *A. salicifolia* (Nees) Mez. BRITISH GUIANA: tree to 17 m. high, 40 cm. diam., bark sweet-scented (but not as strongly as that of *A. Kappleri*, according to the collector), branchlets slender, reddish-brown or gray, cylindrical, with conspicuous lenticels, leaves subverticillate or alternate, chartaceous, inflorescences numerous, axillary and terminal, or subterminal, cymose-paniculate, flowers pale green, with downy flattened pedicels, fruit glaucous-green, purple when ripe, cupule hemispherical (subrotund), smooth, and according to Kostermans with rather large ferruginous wart-like spots, "Silverballi," flat light brown sandy areas with Aimoradan dominant, Mazaruni Station, *F726* (3462). Reported from the Amazon Basin

as well as the type-locality in French Guiana. The panicles of the cited specimen are more full-flowered than reported for the species. Possibly *A. trinitalis* (Meissner) Mez.

AIOUEA DEMERARENSIS Kostermans. BRITISH GUIANA: tree 9 m. high, to 15 cm. diam., basally swollen, bark faintly aromatic, young branches verticillate, branchlets gummy, leaves stiffly coriaceous but brittle, shining and smooth above, beneath opaque and prominulous-reticulate, inflorescences terminal, branchlets crimson, many-flowered, flowers small, greenish-yellow, secondary Dimorphandra Davisii forest, Bartica-Potaro Road, 107 mile, *F1439* (4175); Wallaba forest, Ituni Road, Mackenzie, Demarara River, *F2480* (5216). Reported only from British Guiana, and said to be used for gargling against sore throat.

LICARIA CAYENNENSIS (Meissner) Kostermans. *Acrodiclidium cayennense* (Meissner) Mez. BRITISH GUIANA: tree 12–24 m. high, 17–35 cm. diam., bark strongly aromatic, leaves thinly coriaceous, glabrous, flowers in short erect axillary or subterminal panicles, ferruginous-tomentellous, "Waibama," Greenheart forest, on brown sand, Moraballi Creek, Essequibo River, *F1290* (4026). SURINAM: between North Ridge and Augustus Creeks, altitude 570 m., Tafelberg, *24725*. Reported only from the Guianas.

Fanshawe describes the buds as pale green with a faintly rusty pubescence; Kostermans gives them as glabrous. Meissner's type of *Aydendron cayennense* is in fruit, and the leaves are somewhat more coriaceous, as is frequently found to be the case of fruiting specimens in other species. Otherwise the specimens cited agree.

LICARIA CANELLA (Meissner) Kostermans. BRITISH GUIANA: tree up to 35 m. high, 60 cm. diam., bark fairly smooth, silvery-grayish, leaves coriaceous, glabrous, shining on both surfaces, margins thickened and frequently noticeably inrolled near base, particularly in dried material, flowers greenish-cream, covered with ferruginous tomentum, fruit green, supported by a dull green cupule with brown corky warts, "Silverballi," Bonasika Reserve, Essequibo County, *C. W. Anderson 381;* on light brown sand, miscellaneous forest, altitude 15 m., Mazaruni Station, For. Dept. *2299* (D 308). Reported from Trinidad, the Guianas, and Rio Negro, Brazil.

LICARIA cf. *L. oppositifolia* (Nees) Kostermans. BRITISH GUIANA: tree (or shrub) to 6 m. high, 15 cm. diam., with slightly aromatic bark, branchlets straight, angular, ferruginous-tomentellous, becoming less so with age, apex caudate-acuminate, inflorescence short, axillary, golden-sericeous, flowers, according to the collector, scarcely opening, fruit oval, dull black, thinly fleshy, cupule hemispheric, red, rugulose, secondary forest on rubber estate, Mabaruma, Aruka River, N. W. D., *F2390* (5126). Reported only from British Guiana.

The leaves of the type are rounded at the base (although the description reads shortly acute as well) and are said to be ovate or ovate-lanceolate. The flowers of the Fanshawe number usually have six abortive stamens or staminodia which are very small, hairy and scale-like. The nearest alliance, however, is seemingly with the above species.

LICARIA cf. *L. multiflora* Kostermans. BRITISH GUIANA: tree 30 m. high, 60 cm. diam., buttressed to 4.5 m., branchlets densely but minutely ferruginous-tomentellous, becoming grayish, leaves chartaceous, inflorescence axillary, paniculate, ferruginous-tomentellous, many-flowered, up to 10 cm.

long, flowers minute, creamy, "Ginger Gale," mixed forest on a high ridge, Takutu Creek to Puruni River, Mazaruni River, *F2095* (4831). Described from the Rio Acre region of Brazil.

The inflorescence of the specimen from Guiana is not as full-flowered as that of the type. The leaves of the latter are, on the whole, smaller and perhaps more shining on the upper surface. The flower structure of both is similar, the stamens of the type being exserted to a greater degree than those of the Fanshawe number.

Licaria Maguireana Allen, sp. nov. Arbor 24 m. alta, cortice rubrobrunneo papyraceo, ramulis robustis rugosis. Folia verticillata, supra glabra, subtus pubescentia mox glabrescentia, petiolis 1 cm. vel minus longis ad 7 mm. diam., robustis turgidis, laminis crasse chartaceis longe obovatis, basin longoattenuatis, 60 cm. longis et 16 cm. latis, basi cordatis vel subcordatis, apice obtusis vel obtuse breviterque acuminatis, penninerviis, costa supra satis elevatis conspicuisque, subtus crassissimis, nervis 10–24 paribus laminae basi patentibus ad apicem marginibus arcuantibus utrinque elevatis. Inflorescentiae numerosae subterminales multiflorae strictae racemoso-spicatae, 17–30 cm. longae ad 4 cm. latae. Flores longo-pedicellati, pedicellis 4–7 mm. longis, tenuibus, perianthio suburceolato, viridi, fide coll., lobis squamosis suborbicularibus, staminodiis exterioribus 9, tenuibus oblongis subligulatis pubescentibus, staminibus fertilibus 3, plus minusve seriebus exterioribus duplo longioribus, antheris subauricularibus, filamentis crassis pubescentibus, partem $\frac{2}{3}$ aequantibus, loculis apicale extrorsis, connectivo leviter exserto breve obtuso pubescente, staminodiis anguste triangularibus, seriebus exterioribus leviter longioribus, attenuate acutis pubescentibus, ovario obovoideo-ellipsoideo glabro, stylo plus minusve ovarium aequante glabro, stigmate truncato inconspicuo. Fructus, fide coll., ovoideus, viridis, nitidus.

TYPE: Greenheart bush on brown sand, Mazaruni Station, British Guiana, *Fanshawe 220* (F. D. 2956). New York Botanical Garden. Yaruru-Wamara forest, on light brown sand, Ituni Road, Mackenzie, Demerara River, British Guiana, *F2485* (5221).

The nearest alliance of this species seems to be *L. Mahuba* (Sampaio) Kostermans [Meded. Bot. Mus. Utrecht **46**: 123. 1938 (Rec. Trav. Bot. Néerl. **35**: 123. 1938)] from the flooded forests of Pará, Brazil. It differs from the Brazilian species, however, in having no tiny glands at the base of the three fertile stamens, a more strict inflorescence, more fully flowered, with long-pedicellate flowers in short racemules, and a cordate leaf-base. There is also a resemblance vegetatively to the genus *Mezilaurus*, which is borne out by the absence of glands in the latter genus.

ENDLICHERIA PYRIFORMIS (Nees) Mez. SURINAM: slender shrub (to large tree 30 m. high), branchlets slender with long internodes, smooth, shining, glabrous, pale green, leaf-blades thinly chartaceous, glabrous, shining green, slightly decurrent on slender petioles, inflorescences axillary, paniculate, few-flowered, flowers white, rare, overhanging stream, high forest, East Ridge Creek Gorge, Tafelberg, altitude 750 m., *24538*. Reported from the Amazon Basin and the Guianas.

ENDLICHERIA SERICEA Nees. SURINAM: tree 10–20 m. high, 50 cm. diam., wood "slippery," branchlets stout, striate, densely minutely yellowish subsericeous beneath, inflorescences paniculate, axillary or subterminal, densely minutely subsericeous, yellowish or brownish, many-flowered, frequent in

diabasic soil, mixed high forest, hill No. 1, 5 km. n. e. Savanna II, Tafelberg, altitude 555 m., *24712*. Known from the West Indies, the Guianas and vicinity.

The species is striking because of the golden satiny pubescence on the lower surface of the leaves and the prominence of the lower pairs of nerves, simulating a 3-nerved condition.

ENDLICHERIA ENDLICHERIOPSIS (Mez) Kostermans. SURINAM: tree, branchlets thick, angular, densely ferruginous-velutinous-tomentellous, leaves chartaceous or rigidly chartaceous, elliptic, adult brownish above dull, glabrous, beneath ferruginous-pubescent, inflorescences axillary, paniculate, pyramidal, ferruginous-tomentose, Toekoemoetoe Creek, Saramacca River, *24898a*. Reported by Kostermans from both French and Dutch Guiana. The pistillate specimen cited above appears to answer the description of the species.

CASSYTHA FILIFORMIS Jacquin. BRITISH GUIANA: parasitic leafless climber, stems yellow-brown, flowers white, occasional, trailing along ground in grassy open place, Kaieteur savannas, *23314*. SURINAM: frequent, Sanderij, Savanna II, *23700;* Sanderij I, *23726;* south savannas, Arawak village of Mata, *24966;* Savanna I, altitude 560 m., Tafelberg, *24399*. Pantropic.

Doubtful species of the collection.

Infrequent, south cliffs, Arrowhead Basin, Tafelberg, Surinam, *24472*. *Ocotea* or *Nectandra*. The flower structure of the specimen *24472* more nearly resembles that of a *Nectandra*. Occasionally, however, there are aberrant *Ocotea* specimens which bear anther-sacs approximating the arrangement common in *Nectandra*. If the specimen be an *Ocotea,* it is an hermophroditic species.

High forest, base south cliffs, Arrowhead Basin, Tafelberg, Surinam, *24472B*. A fruiting specimen of *24472*.

Shrub 4.5 m. high, leaves leathery, glossy, flowers in terminal or axillary cymose panicles, creamy, calyx pale green, second growth by roadside on lateritic ironstone soil, Mahdia Creek, Potaro River, Bartica-Potaro Road, British Guiana, *F741* (3477), "Yekuru." *Ocotea*? hermaphroditic specimen. Mounted on the same sheet with this number in the herbarium of the New York Botanical Garden is a small branchlet of a species which appears to be a part of *F906* (3642), *Ocotea Schomburgkiana*.

Tree 12 m. high, 15 cm. diam., leaves leathery, pubescent beneath, flowers in axillary inflorescences, whitish, buds gray, velvety, fruit oblong, smooth, green, cupule brown, woody, opening flat, mixed bush on brown sand by river, Madray Landing, Essequibo River, British Guiana, *F1702* (4438), "Shirua." Presumably the same as the following Fanshawe number.

Tree 21 m. high, 15 cm. diam., slightly buttressed, leaves thinly leathery, pilose beneath, appearing velvety, flowers in large, terminal, lax inflorescences, palest cream, perianth-lobes spreading, stamens introrse, ropey bush on brown sand, Madray-Bubu trail, Essequibo-Demerara, British Guiana, *F1683* (4419), "Shirua." Probably on *Ocotea*, and more nearly related to *O. commutata*. This number and the preceding one collected at nearly the same locality two days later, although showing a difference in the inflorescence, seemingly, are very likely the same species. Number 4438 shows a more fully developed inflorescence.

The following numbers I have not been able to determine satisfactorily.

The most of them are in fruit, and difficult to match since many of the species concerned have been described from flowering material alone.

Tree 9 m. high, 10 cm. diam., bark faintly aromatic, leaves stiffly chartaceous, sericeous beneath, fruit (not seen) axillary, one or more terminal on a common peduncle, cupule hemispheric, red, rugulose, secondary forest on rubber estate, Mabaruma, Aruka River, N. W. D. British Guiana, *F2387* (5123). Possibly *Aniba* or *Ocotea?*

Small tree to 3 m. high, bark aromatic, leaves large leathery, fruit long-stalked, supra-axillary, solitary, cupule dark brown, warty, fruit white, Kakaralli-Clump Wallaba forest, altitude 107 m., Bartica-Potaro Road, British Guiana, *F1449* (4185). Possibly *Aniba* or *Ocotea?*

Overhanging west escarpment, altitude 510 m., Tafelberg, Surinam, *24675*. Possibly *Aniba* or *Ocotea?*

High mixed wallaba forest, km. 25, altitude 210 m., Tafelberg, Surinam, *24825*. Possibly *Aniba* or *Ocotea?*

Diabasic soil, mixed high forest, hill No. 1, altitude 540 m., Tafelberg, Surinam, *24710*. Possibly *Aniba* or *Ocotea?*

Tree 3 m. high, 5 cm. diam., young fruit green, oval, glossy, cupule scarlet, occasional, Potaro River below Tukeit, Potaro River Gorge, British Guiana, *23481*. *Nectandra* or possibly *Ocotea?*

Between North Ridge and Augustus Creeks, hill No. 1, altitude 570 m., Tafelberg, Surinam, *24726*. *Ocotea?*

Tree 24 m. high, 40 cm. diam., buttressed to 1.3 m. from ground, leaves thickly chartaceous, glabrous, fruit stalked on cauliflorous inflorescence below leaves, globose, purple-black, glossy, thinly fleshy, cupule small, flat, thick, attached to base of fruit, seed brown, globose, faintly pointed, pulp greenish, creamy, mixed forest on lateritic soil, White Creek, Groete Creek, Essequibo River, British Guiana, *F1772* (4508), "Keriti." *Ocotea?* The rather large globose fruit borne below the leaves should very quickly place this species, but I have not been able to match it as yet.

Tree 12 m. high, 20 cm. diam., with strong, aromatic bark, resembling *Aniba ovalifolia*, leaves soft hairy, petioles of young leaves orange, old fruit-cupules black-brown, velvety, rugose, from Kakaralli-Clump Wallaba forest, 107 mile, Bartica-Potaro Road, British Guiana, *F1501* (4327). *Endlicheria?*

Tree 10 m. high, 12 cm. diam., fruit with enlarged pedicels, high forest, base south escarpment, Arrowhead Basin, Tafelberg, Surinam, *24488*. *Persea?*

Frequent tree to 10 m. high, 12 cm. diam., precipitous east-facing slopes above escarpment, 300 m. south of East Ridge, Tafelberg, Surinam, *24550*. *Persea?* Same as *24488?*

ROSACEAE[47]

The four genera reported upon herein all belong to the subfamily *Chrysobalanoideae*. No general review, aside from Kleinhoonte's[48] studies of Surinam species, has been made of any of the genera of the subfamily since Fritsch's[49] "Beitrage Zur Kenntries der Chrysobalanaceen." The present

[47] By D. B. Fanshawe & Bassett Maguire.

[48] Rec. Trav. Bot. Néerl. 22: 380–391. 1925; 30: 180–182. 1933; Fl. Suriname 2: 426–456. 1939.

[49] Ann. Naturh. Hofmus. 4: 33–60. 1889.

report deals with 44 species of which 5 apparently represent range extensions of consideration, and 11 are offered as new. We wish to express appreciation for the helpful criticism given us by Mr. N. G. Sandwith during the preparation of this report on Guiana Rosaceae.

Licania albiflora Fanshawe & Maguire, sp. nov. Arbor mediocris; ramulis crassis, griseo-fuscis, puberulentibus, foliis elliptico-oblongis vel obovatis, abrupte acuminatis, basibus obtusis, supra glabris, venis inconspicue impressis, inconspicuissime reticulatis, subtus subtile griseo-tomentosis, venis prominentibus, valde reticulatis, petiolis crassis, brevi-villosis, stipulis non visis; inflorescentibus paniculatis, pallidis fulvo-villosis, bracteis late ovatis, fere trilobatus, lobis acutis, tubis calycibus brevibus, lobis longius, ovato-triangularibus, acutis, patentibus, interioribus albo-pilosis, tubis interioribus dense lanato-pilosis; fructibus non visis.

Tree at least 25 m. tall and 30 cm. diam, branchlets coarse, grayish-brown puberulent; leaf blades broadly elliptic-oblong or obovate, abruptly acuminate at the apex, rounded at the base, primary veins 8–10 pairs, slightly impressed in the feebly reticulate and glabrous upper surface, prominent beneath, the strong secondary veins transversely parallel, the tertiary and ultimate veinlets strongly reticulate, the under surface thinly gray-tomentose but the midrib and veins more or less tawny villous, petioles 10–14 mm. long, coarse, short villous, stipules not seen; inflorescence axillary and subterminal, paniculate, 10–15 cm. long, pale, tawny, short-villous, the ultimate branches densely flowered, the bracts 5 mm. or less long, broadly ovate, mostly 3 lobed, the lobes usually acute, bracteoles minute, pedicels 1.0–1.5 mm. long; buds obglobose, 1.5–1.75 mm. long, calyx tube short, lobes 1.5 mm. long, ovate-triangular, acute, patent, densely short-villous without, inner surface thinly white pilose, exceeding the 1 mm. long tube, the tube lanate-pilose within, densely so on the throat, apetalous, stamens exserted, the filaments white, ca. 3 mm. long, style pilose below, the ovary densely white lanate-pilose; fruit not seen.

TYPE: tree 80 ft. high, 12 in. diam., leaves chartaceous, flowers in axillary inflorescences, branches widely divergent, buds and inflorescence pale cream to bronze, velvety, flowers white, sepals spreading, filaments white, glabrous, from Eschweilera-Dicymbe forest on brown sand, Madray-Bubu Trail, Essequibo-Demerara Rivers, *Fanshawe 1678* (F.D. 4414). New York Botanical Garden. Known only by the type collection.

LICANIA APETALA (E. Mey.) Fritsch. *L. floribunda* Benth. BRITISH GUIANA: tree 40 ft. high, 8 in. diam., leaves chartaceous, markedly reticulate beneath, flowers in terminal branched inflorescence, rachis, calyx, etc. yellow-brown pubescent, flower creamy, stamens exserted, from savanna fringe on white sand, Orealla savanna, Courantyne River, *F2587* (F.D. 5375); Moruka River, Pomeroon District, *la Cruz 4539;* savanna between Takutu River and Kanuku Mts., *Smith 3275.* British Guiana, Surinam, French Guiana and Brazil.

Licania arachnoidea Fanshawe & Maguire, sp. nov. Arbor parva; ramulis crassis, glabris; foliis anguste oblanceolatis, acutis vel acuminatis, omnino glabris, venis lateralibus supra prominulis, subtus prominentibus, petiolis glabris, transverse rugosis, bipatelliformi-glandulosis; stipulis

lanceolato-subulatis, persistentibus; inflorescentibus paniculatis fusco-arachnoideo-tomentosis, floribus subsessilibus dense glomeratis; calycibus anguste urceolatis, externe dense fusco-arachnoideo-tomentosis, intus albo-lanatis, petalis rhombico-oblanceolatis, staminibus paucis, exsertis; fructibus non visis.

Tree at least 10 m. high and 25 cm. diam., branchlets coarse, glabrous; leaf blades 17–21 cm. long, 4.5–7.0 cm. broad, narrowly oblanceolate, the apex acute to acuminate, wholly glabrous, lateral veins 12–14 pairs, prominulous above, prominent underneath, petioles 8–10 mm. long, transversely rugose and splitting, bearing a pair of prominent disk shaped glands distally, stipules 10–12 mm. long, lance-subulate, somewhat carinate, with an elongate callosity at the base, persistent; inflorescence axillary, paniculate, to 15 cm. long, brown arachnoid-tomentose, the flowers subsessile, densely glomerate on the secondary axes; calyx 3.0–3.5 mm. long, narrowly urceolate, densely brown arachnoid-tomentose externally, the lobes 5, erect, broadly triangular, acute, 0.8–1.0 mm. long, thinly lanate within, petals 5, 1.5 mm. long, exserted, rhombic-oblanceolate, densely white arachnoid, stamens 4–5, exserted, upwardly more or less connivent, the filaments connate into a conical base, attached at the orifice of the calyx tube, the free portion of the filaments ca. 0.3–0.5 mm. long, densely white arachnoid-lanate, the entire androecium 1.5–2.0 mm. high, staminodia 4–5, reduced or vestigial; calyx tube internally tomentose, style equalling the anthers, ca. 3.5–4.0 mm. long, arachnoid, except at the apex; fruit not seen.

TYPE: Tree 30 ft. high, 5 in. diam., leaves leathery, flowers glomerate on branches of inflorescence, all parts clothed with a fawn-brown cottony wool, from Eschweilera-Dicymbe forest, 107 mile, Bartica-Potaro Road, British Guiana, *Fanshawe 1495* (F.D. 4231). New York Botanical Garden. Known only by the type collection.

Licania arachnoidea is most closely related and superficially similar to *L. macrophylla* Benth. but differs strongly in a number of critical points, as the following comparative analysis shows:

L. arachnoidea (type)	*L. macrophylla* (isotype)
1. Paired glands at base of leaf blade raised, elliptic-orbicular.	1. Paired glands depressed, more or less orbicular, sometimes 1 or both obsolete.
2. Stipules more or less membranous, soon disintegrating, with an inconspicuous callosity at the base.	2. Stipules firm, persistent, not soon disintegrating, with a conspicuous callosity at the base.
3. Inflorescence arachnoid-tomentose, flowers densely glomerate on the secondary branches.	3. Inflorescence merely crisped-puberulent, flowers not densely glomerate.
4. Calyx 3.0–3.5 mm. long, narrowly urceolate, densely arachnoid-tomentose.	4. Calyx 3.5–4.0 mm. long, broadly campanulate, merely puberulent.
5. Petals rhombic-oblanceolate.	5. Petals ovate-lanceolate.
6. Stamens 4–5, staminodes 4–5, reduced or vestigial, the staminal ring conic.	6. Stamens mostly 3, staminodes of equal size, mostly 2, staminal ring hardly conic.
7. Ovary densely lanate-tomentose.	7. Ovary merely villous.

LICANIA AXILLIFLORA (Sagot) Hochr. *L. incana* Aubl. var. *axilliflora* Sagot. SURINAM: tree 15 m. high, 30 cm. diam., glomerules short, axillary, seldom terminal, flowers creamy, externally tomentose, the perianth lobes

acutish, subpilose, arachnoid within, stamens mostly 5, equalling the lobes, filaments pilose at the base, young fruit arachnoid-tomentose, deeply sulcate, lateritic soil, mixed wallaba forest, Schmidt Mt., km. 8, Coppenam River drainage, *24862*. British Guiana, Surinam and French Guiana. Possibility a variety of *L. leptostachya* Benth., and so treated by Kleinhootne[50] [for discussions of problems concerning its specificity see Sandwith, Kew Bull. 1931: 373, and Benoist, Bull. Mus. Paris 25: 515 (1919)].

LICANIA DENSIFLORA Kleinh. Rec. Trav. Bot. Néerl. 22: 383. 1925. *L. kanukuensis* Standl. Lloydia 2: 182. 1939. BRITISH GUIANA: tree 60 ft. tall, 12 in. diam., mixed forest, lateritic hill-slopes, Siba Creek, *F671* (F.D. 3407). SURINAM: tree 20 m. tall, 30 cm. diam., flowers tawny, primary jungle, Posoegronoe, Saramacca River, *24024*. British Guiana, Surinam. Our collection is undoubtedly conspecific with the type of *L. kanukuensis* Standl., *Smith 3420*, and *Smith 3563* from Kanuku Mts., British Guiana; also with *Sandwith 341*, Moraballi Creek, and *Anderson 57*, Amacura River, both likewise of British Guiana. The Sandwith and Anderson collections were compared by Sandwith[51] to authentic material of *L. densiflora* borrowed by himself from Utrecht.

LICANIA DISCOLOR Pilger. SURINAM: tree 30 m. high, 50 cm. diam., profusely flowering, flowers yellowish-green, frequent, stony soil derived from diabase, mixed montane forest, North Ridge, Tafelberg, *24795*. This collection conforms fairly well to the species as described by Pilger, and is similar to *Smith 2270* and *2923*, from British Guiana, so identified by Standley. The flowers of our material have 4–5 stamens. *L. discolor*, in the orginal description, is purported to have 3 stamens. Three stamens are found in the Smith collections. British Guiana to Amazonas, Brazil.

LICANIA ELLIPTICA Standl. SURINAM: tree 15 m. high, 20 cm. diam., leaves pale beneath, flowers creamy, Toekoetoemoe Creek, Headwaters Saramacca River, *24066*.

In our specimens the leaves are proportionately somewhat narrower than those of the type collection, *Krukoff 5014*, from Rio Embira, Amazonas, Brazil. In the type specimens the inflorescence is almost glabrous and the calyx provided with a 0.5 mm. stipe, while in the Surinam specimens the inflorescence is manifestly puberulent and the campanulate calyx sessile. There appear rather consistently to be five stamens in the flowers of both collections, although sometimes one or two of the delicate filaments may not bear anthers, contrary to the statement in the original description (based on *Krukoff 5014*)—"stamina vulgo 3."[52] Hitherto known only from the type collection.

LICANIA GUIANENSIS (Aubl.) Griseb. BRITISH GUIANA: frequent small tree to 3 m. high, 6 cm. diam., mixed forest, Kamuni Creek, Groete Creek, Essequibo River, *22949*. Guiana.

LICANIA INCANA Aubl. BRITISH GUIANA, Kaieteur Plateau: shrub to 1.6 m. high, rounded, leaves leathery, glaucous below, flowers creamy, tomentose, dry sandy savanna, *23151;* shrubby, 1 m. high, leaves glaucous beneath, occasional in open savanna, *23266;* Mazaruni Station, *F633* (F. D. 3369). SURI-

[50] Flora Suriname 2: 435. 1939.
[51] Kew Bull. 1931: 372.
[52] Field Mus. Publ. Bot. 17: 255. 1937.

NAM: shrub, occasional, grass savanna, Zanderij II. *23651;* south savanna. Mata, *24982;* Tafelberg: shrub to 3 m. high, leaves silvery-tan beneath, flowers tan, frequent, Savanna II, *24234;* small tree 10 m. tall, 8 cm. diam., buds tan, flowers cream-colored, low bush 1 km. south Savanna I, *24354;* shrub to 4 m. high, leaves whitish beneath, pigmy bush openings, Savanna VIII, *24438;* shrub to 3 m. high, leaves silvery-tan beneath, flowers tan, fruit red-brown, frequent, Savanna VII, *24791.* Guianas.

This species as represented by the above collections is highly polymorphous, the leaves varying considerably in size, and the flowers strikingly so in length (2–4 mm.) and pubescence, some being arachnoid, others merely short-villous within. Larger flowered forms seem to dominate on the inland plateaus, smaller flowered ones on coastal savannas. Possibly ecologic variants have been segregated out of the complex.

LICANIA HETEROMORPHA Benth. BRITISH GUIANA: tree 100 ft. high, 20 in. diam., unbuttressed, stamens 4, Moraballi Creek, *F265* (F.D. 3001); tree 120 ft. high, 16 in. diam., stamens 4, Mazaruni Station, *F650* (F.D. 3386); tree 90 ft. tall, 12 in. diam., fruit globose, gray-brown, cracked, woody, flesh thick and corky, kernel pink, Mazaruni Station, *F1358* (F.D. 4094); Barabara Creek, Lower Essequibo River, *F944* (F.D. 3680); tree 40 ft. high, 8 in. diam., Mazaruni River by Kaow Creek, *F1336* (F.D. 4072); Kaituma River, Barima River, *F2469* (F.D. 5205). The following three collections are questionably assigned to *L. heteromorpha,* having both oblanceolate blades with relatively longer petioles and short pink or white, erect petals: tree 90 ft. high, 12–16 in. diam., Mazaruni Station, *F607* (F. D. 3343), *F1420* (F.D. 4156), and *F1981* (F.D. 4717). A frequent forest tree, British Guiana, Surinam, French Guiana, Brazil. The species is perhaps too broadly interpreted here. It is hoped later critically to review *L. heteromorpha* in its various racial aspects.

Licania laxa Fanshawe & Maguire, sp. nov. Arbor mediocris; ramulis crassis, minute puberulentibus; foliis lanceolatis, basibus subconduplicatis, apicibus acutis subconduplicatis, glabris, venis supra prominulis, subtus valde prominentibus, petiolis arcuatis, brevissimo-villosis, stipulis linearilanceolatis, subcoriaceis, puberulentibus; inflorescentibus paniculatis, laxe pendulosis, cymulis subsessilibus; calycibus turbinato-campanulatis aliquantum sulcatis; fructibus maturis non visis.

Tree at least 70 ft. tall and 16 in. diam., branches coarse, minutely puberulent, soon glabrate; leaf blades 10–12 cm. long, 3.5–5.0 cm. broad, lanceolate, the base subcordate, V-shaped in cross-section, particularly at the recurved apex and base, hence, when pressed flat, the apical and basal surfaces partially adpressed, glabrous, primary veins 7–8 pairs, strongly arching upwards, prominulous above, strongly prominent beneath, secondary veinlets faintly transversely reticulate, the petiole 5 mm. long, very short brown-villous, stipules 5 mm. long, linear-lanceolate, puberulent, subcoriaceous; inflorescence terminal, paniculate, 17 cm. long, grayish brown villous, short, the branches pendulous, densely spicate, the cymules subsessile, bracts linear-lanceolate, 3–4 mm. long, bracteoles triangular, shorter; the calyx 3.0–4.0 mm. long, turbinate-campanulate, somewhat sulcate, lobes ovate, ca. 1 mm. long, stamens 7–8 (10), the oppositisepalous, longer with filaments ca. 1 mm. long, calyx tube short villous within, ovary densely villous, style villous at the base, pilose upwards, the apex appendage-like, con-

stricted and glabrous; young fruit elongate brown villous with paler intermixed longer hairs, mature fruit not seen.

TYPE: tree 70 ft. tall, 16 in. diam., leaves glabrous, strongly nerved, flowers in terminal inflorescence, spikes densely flowered, flowers cream, campanulate, young fruit rusty-tomentose, resembles *L. venosa* in bark and habit, from island of bush in falls, Kurihi Rapids, Essequibo River, British Guiana, *Fanshawe 1665* (F.D. 4401). New York Botanical Garden. Known only by the type collection.

The large flowers resemble those of *L. majuscula* Sagot which are described as ½ cm. long, and as having 15 stamens. The large drooping inflorescence and glabrous, apically and basally recurved, subconduplicate leaves make this a strongly marked species.

LICANIA LAXIFLORA Fritsch. BRITISH GUIANA: tree 15 m. high, 30 cm. diam., fruit rusty-tomentose, wrinkled, occasional, on white sand, mixed forest, Potaro River below Tukeit, *23511;* Mahdia River, Potaro River, 107 mile Bartica-Potaro Road, *F1019* (F.D. 3755), *F1020* (F.D. 3756). Known only from British Guiana.

LICANIA MICRANTHA Miq. BRITISH GUIANA: tree 100 ft. tall, 20 in. diam., leaves buff underneath, flowering stems glaucous, relic in secondary forest in light brown sand plain behind station, replaces *L. densiflora* on loose colored sand of the area, Mazaruni Station, *F324* (F.D. 3060); Demerara River, la Cruz *2739;* Wismar, *Persaud 79.* By letter Mr. N. Y. Sandwith has supplied the following additional records that should go here: Mazaruni Station, *F204* (F.D. 2940); Essequibo River, *Jenman 1314;* and, Little Wineperu Creek, *F400* (3136). British Guiana, Surinam, Brazil. Apparently unrecorded for British Guiana.

Licania microphylla Fanshawe & Maguire, sp. nov. Arbor mediocris, ramulis tenuis, puberulentis; foliis parvis, ovatis vel elliptico-ovatis, supra glabris, subtus dense tomentosis, petiolis brevibus, puberulentibus, bipatelliformi-glandulosis, stipulis brevibus, subulatis, puberulentibus; inflorescentibus spicatis vel subpaniculatis; floribus non visis; fructibus obovatis, stipitatis, subquadrangularibus, indumentibus dense compactis, reticulato-rugulosulis.

Tree at least 18 m. high and 15 cm. diam., unbuttressed, branchlets slender, puberulent, becoming glabrate, inconspicuously lenticellate; leaves 3–4 cm. long, 1–2 cm. broad, ovate to elliptic-ovate, primary veins 5–6 pairs, ascending at a 45° angle with the midrib, upper surface glabrous, drying brown, veins feebly impressed, faintly reticulate, lateral veins inconspicuous on the lower surface, tomentum dense, uniform, tan in color, all but obscuring the underlying reticulum, petioles 2–3 mm. long, puberulent, with 1 or mostly 2 patelliform glands at the base of the blade; stipules 2 mm. long, linear-subulate, puberulent; inflorescences lateral and terminal, spicate or somewhat paniculate, apparently 8 cm. or less long, puberulent, densely flowered, the flowers sessile, the bracts ca. 0.7 mm. long, acutish; flowers not seen; fruit ca. 1 cm. long, 6–8 mm. thick, obovate, obscurely quadrangular, abruptly stipitate, the stipe 3–4 mm. long, indument dense, compact, granular, reticulate-rugulose, tan in color.

TYPE: tree 50 ft. high, 6 in. diam., unbuttressed, leaves small, chartaceous, fruit in axillary and terminal spikes, obovoid, squarish, dull red, from mixed forest on colored sands, Mahdia River, Potaro River, 107 mile, Bartica-

Potaro Road, British Guiana, *Fanshawe 1078* (F.D. 3814). New York Botanical Garden. Known only by the type collection.

Licania microphylla is most closely related to the diversified *L. parviflora* of Pará and northern Brazil.

LICANIA MOLLIS Benth. BRITISH GUIANA: tree 90 ft. tall, 16 in. diam., unbuttressed, leaves stiff, velvety below, margin involute, from *Eschweilera-Dicymbe* forest on lateritic ironstone soil, Mahdia River, Potaro River, 107 mile, Bartica-Potaro Road, *F1032* (F.D. 3768); tree 80 ft. tall, 10 in. diam., unbuttressed, *Dicymbe* forest on white sand, data otherwise as above, *F1059* (F.D. 3795). Apparently previously unreported from British Guiana.

LICANIA MINUTIFLORA (Sagot) Fritsch. BRITISH GUIANA: tree 135 ft. high, 24 in. diam., (grows to 150 ft. high and 36 in. diam.), low buttresses to 3 ft., leaves chartaceous, paniele and calyx velvety with a close tomentum of buff hairs, buds yellowish, calyx patent in flower, corolla creamy deciduous as flower opens, stamens in a ring, basally connate, hairy, style and ovary hairy, mixed Kautaballi forest on brown sand, Makauria Creek, Essequibo River, *F598* (F.D. 3334); Takutu Creek, Mazaruni River, *F2004* (F.D. 4740). British and French Guiana. Previously unreported for British Guiana.

Licania paniculata Fanshawe & Maguire, sp. nov. Arbor parva; foliis amplis, elliptico-oblanceolatis, brevi-acuminatis, stipulis persistentibus, coriaceis, lineari-subulatis; inflorescentibus paniculatis, fasciculatis, calycibus substipitatis, gibboso-campanulatis; petalis obsoletis; fructibus non visis.

A tree at least 12 m. tall, 15 cm. diam., branchlets slender, terete, ash-gray; petioles 4–6 mm. long, terminating in two more or less prominent callosities that are subdecurrent on the base of the blade, the blade 15–20 cm. long, 5.5–7.5 cm. broad, elliptic-oblanceolate, short acuminate at the apex, the base obtuse or only somewhat acute, chartaceous, primary veins 7–8 pairs, arcuate upwards and finally anastamosing 2–3 mm. from the margins, upper surface glabrous, lower surface with a smooth, close, granular, silvery-tan tomentulum; stipules persistent, ca. 4 mm. long, coriaceous, linear-subulate, glabrous; inflorescence paniculate, axillary and subterminal, fascicled, usually 3–10 peduncles per node, 10–13 cm. long, the branches angled, minutely puberulent, the bracts soon falling, bracteoles ca. 1 mm. long, triangular, acute, puberulent, cymules 3-flowered, subsessile, or the pedicel as much as 1.5 mm. long; calyx gibbose-campanulate, ca. 2.75 mm. long, the lobes ovate, obtuse, 0.75 mm. long, closely tomentulose outside, inconspicuously pubescent within, corolla obsolete or represented by a distinctly discernible ring, stamens 5 (7), filaments slender, ca. 0.5 mm. long; fruit not seen.

TYPE: tree 12 m. high, 15 cm. diam., wood hard, flowers cream-colored, mixed forest, Toekoemoetoe Creek, Saramacca River, Surinam, *Maguire 24068*. New York Botanical Garden. Known only by the type collection.

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LAZELLA SCHWARTEN

WITH THE COLLABORATION OF THE EDITOR OF THE TAXONOMIC INDEX

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Aitken, Mary M. Isolation of blue-green algae for pure culture. Proc. Ind. Acad. **56**: 77–79. 1947.

Fletcher, Joel E. & Martin, W. P. Some effects of algae and molds in the rain-crust of desert soils. Ecology **29**: 95–100. *f. 1–3 + table 1.* Ja 1948.

Le Gallo, *Père* C. Algues marines des îles Saint-Pierre et Miquelon. Nat. Canad. **74**: 293–318. *f. 1–6.* N–D 1947 [Ja 1948].

Wood, R. D. Characeae of the Put-in-Bay region of Lake Erie [Ohio]. Ohio Jour. Sci. **47**: 240–258. *pl. 1–4.* N 1947 [Ja 1948].

FUNGI AND LICHENS

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Ajello, Libero. A cytological and nutritional study of *Polychytrium aggregatum*. I. Cytology. Am. Jour. Bot. **35**: 1–12. *f. 1–40.* Ja [F] 1948.

Barnett, H. L. & Lily, Virgil Greene. The relation of thiamin to the production of perithecia by *Ceratostomella fimbriata*. Mycologia **39**: 699–708. N–D 1947 [6 Ja 1948].

Cocke, Elton C. Observations on gonidia formation in *Cylindrospermum*. Jour. Elisha Mitchell Soc. **63**: 213, 214. D 1947.

Coker, W. C. North Carolina species of *Volvaria*. Jour. Elisha Mitchell Soc. **63**: 220–230. *pl. 28–32.* D 1947.

Cummins, George B. Some problems in mycological taxonomy. Mycologia **39**: 627–637. *port.* N–D 1947 [6 Ja 1948].

Jackson, H. S. *Trichomonascus*, a new genus among simple Ascomycetes. Mycologia **39**: 709–715. *f. 1–20.* N–D 1947 [6 Ja 1948].

Kanouse, Bessie B. A survey of the Discomycete flora of the Olympic National Park and adjacent areas. Mycologia **39**: 635–689. *f. 1–35.* N–D 1947 [6 Ja 1948].

Kelman, Arthur. A rare species of *Isoachyla* found in North Carolina. Jour. Elisha Mitchell Soc. **63**: 207–211. *pl. 27.* D 1947.

Korf, Richard P. *Seaverinia Geranii*. Mycologia **39**: 743. N–D 1947 [6 Ja 1948].

Luttrell, E. S. The morphology of *Ellisiodothis inquinans*. Am. Jour. Bot. **35**: 57–64. *f. 1–36 + table 1.* Ja [F] 1948.

Magnusson, A. H. Some lichens from Argentina. Acta Hort. Gothob. **17**: 59–76. 18 Je 1947.

Martínez, Argentino. Nota sobre un hongo invasor de los cultivos de *Agaricus campestris*. Revista Argent. Agron. **14**: 273–278. *pl. 4 + f. 1.* D 1947.

Seaver, Fred J. Fungi [of Guiana] *In:* Maguire, B. *et al.* Plant explorations in Guiana in 1944, chiefly to the Tafelberg and the Kaieteur Plateau—I. Bull. Torrey Club **75**: 60–63. *f. 2.* 29 Ja 1948.

Simmons, Emory G. Studies in the stromatic Sphaeriales of Indiana. Proc. Ind. Acad. **56**: 38–74. 1947.

Singer, Rolf & Smith, Alexander H. Additional notes on the genus *Leucopaxillus*. Mycologia **39**: 725–736. *f. 1–3*. N–D 1947 [6 Ja 1948].

Sprague, Roderick & Johnson, A. G. *Selenophoma* on grasses, III. Mycologia **39**: 737–742. N–D 1947 [6 Ja 1948].

Waterman, Alma M. & Marshall, Rush P. A new species of *Cristulariella* associated with a leaf spot of maple. Mycologia **39**: 690–698. *f. 1, 2*. N–D 1947 [6 Ja 1948].

Wilhelm, Stephen. The dual phenomenon in the dermatophytes. Mycologia **39**: 716–724. *f. 1, 2*. N–D 1947 [6 Ja 1948].

Bryophytes

Bartram, Edwin B. Musci [of Guiana]. *In:* Maguire, *B. et al.* Plant explorations in Guiana in 1944, chiefly to the Tafelberg and the Kaieteur Plateau—I. Bull. Torrey Club **75**: 64–66. 29 Ja 1948.

Fulford, Margaret H. Hepaticae [of Guiana]. *In:* Maguire, B. *et al.* Plant explorations in Guiana in 1944, chiefly to the Tafelberg and the Kaieteur Plateau—I. Bull. Torrey Club **75**: 64. 29 Ja 1948.

Jovet-Ast, S. Hepatiques des Antilles francaises recoltees par P. et V. Allorge en 1936. Revue Bryol. Lichenol. II. **6**: 17–46. *f. I–X*. 1947.

Wagner, Kenneth A. Additional distribution records of Hepaticae in Indiana. Proc. Ind. Acad. **56**: 86–91. *f. 1*. 1947.

Wagner, Kenneth A. A consideration of some reports in Indiana liverworts. Proc. Ind. Acad. **56**: 92–94. 1947.

Pteridophytes

Copeland, Edwin Bingham. *Cyathea* in New Guinea. Philipp. Jour. Sci. **77**: 95–124. *pl. 1–15*. Je 1947.

Dix, W. L. The ferns of Wayne County, Pennsylvania. Am. Fern Jour. **37**: 100–110. 29 D 1947.

Hall, Carlotta C. A *Pellaea* of Baja California. Am. Fern Jour. **37**: 111–114. *pl. 6*. 29 D 1947.

Maxon, William R. & Morton, C. V. Pteridophyta [of Guiana]. *In:* Maguire, B. *et al.* Plant explorations in Guiana in 1944, chiefly to the Tafelberg and the Kaieteur Plateau—I. Bull. Torrey Club **75**: 66–80. 29 Ja 1948.

Morton, C. V. Some notes on Hawaiian Asplenieae. Am. Fern Jour. **37**: 114–119. 29 D 1947.

Raymond, Marcel & Kucyniak, James. *Dryopteris hexagonoptera* in Quebec. Am. Fern Jour. **37**: 97–99. 29 D 1947.

Shanks, Royal E. *Trichomanes boschianum* Sturm at Sewanee, Tennessee. Jour. Tenn. Acad. **22**: 146–148. 1947.

Weatherby, C. A. *Asplenium montanum* in south-central Massachusetts. Rhodora **50**: 20. 13 Ja 1948.

Weatherby, C. A. Glandular *Cystopteris fragilis* in the Rocky Mountains. Am. Fern Jour. **37**: 122, 123. 29 D 1947.

Wherry, Edgar T. A crispate variant of the Christmas fern. Am. Fern Jour. **37**: 121. 29 D 1947.

Wiggins, Ira L. A fern new to Baja California. Am. Fern Jour. **37**: 119, 120. 29 D 1947.

SPERMATOPHYTES
(See also under Morphology: **Bailey & Nast**)

Abbe, Ernst C. *Braya* in boreal eastern America. Rhodora **50**: 1–15. *pl. 1088–1090.* 13 Ja 1948.

Abbiatti, Delia. Las Eriocaulaceas argentinas. Revista Mus. La Plata Bot. 6^{26}: 311–341. *pl. 1, 2 + f. 1–10.* 28 F 1946.

Airy Shaw, H. K. Typification of new names derived from persons or places. Kew Bull. **1**: 35–39. 1947.

Bailey, L. H. Indigenous palms of Trinidad and Tobago. Gent. Herb. **7**: 353–445. *f. 143–210.* 27 D 1947.

Bailey, L. H. Palmae [of Guiana]. *In:* Maguire, B. *et al.* Plant explorations in Guiana in 1944, chiefly to the Tafelberg and Kaieteur Plateau—I. Bull. Torrey Club **75**: 102–115. *f. 5–15.* 29 Ja 1948.

Barkley, Fred A. Texas plant collectors as represented in Texas herbaria. Am. Midl. Nat. **38**: 638–670. *tables 1, 2.* N 1947 [Ja 1948].

Blake, S. T. The Cyperaceae collected in New Guinea by L. J. Brass, III. Jour. Arnold Arb. **29**: 90–102. *f. 1. 15 Ja 1948.*

Buchholz, John T. & Gray, Netta E. A taxonomic revision of *Podocarpus.* I. The sections of the genus and their subdivisions with special reference to leaf anatomy. Jour. Arnold Arb. **29**: 49–76. *pl. 1–4.* 15 Ja 1948.

Burkart, Arturo. Leguminosas neuvas o criticas, II. Darwiniana **7**: 504–540. *f. 1–7.* 17 S 1947.

Cabrera, Angel L. & Saravi Cisneros, Rodolfo. Malezas bonarienses. Bol. Agr. Dir. Agr. Ind. La Plata 26^{10}: 1–18. *f. 1–19.* 31 D 1946.

Carter, George F. Some archaeologic cucurbit seed from Peru. Acta americana [Mexico] **3**: 163–172. Jl–S 1945.

Conzatti, Casiano. Flora taxonómica mexicana [Monocotiledoneas: Diperiantadas—Superovaricas e Inferovaricas]. **2**: 1–220. 24 S 1947.

Correll, Donovan, S. Additions to the orchids of Texas. Wrightia **1**: 166–182. *f. 6–10.* 15 D 1947.

Croizat, L. Notes on the Euphorbiaceae III. Bull. Bot. Gard. Buitenzorg **17**: 209–219. Ap 1942.

Cronquist, Arthur. Notes on the Compositae of the northeastern United States. VI. Cichorieae, Eupatorieae and Astereae. Rhodora **50**: 28–35. F 1948.

Dahl, Eilef. Two new plants from Greenland. Nytt Mag. Naturvid. **82**: 101–104. *f. 1, 2.* 25 Mr 1941.

Ducke, Adolfo. Novas contribuições para o conhecimento das seringueiras da Amazônia Brasileira II. Bol. Téc. Inst. Agron. Norte [Belém] **10**: 1–24. 29 D 1946.

Ducke, Adolfo. Plantas de cultura precolombiana na Amazônia Brasileiro. Notas sôbre as especies ou formas espontâneas que supostamente ihes teriam dado origem. Bol Téc. Inst. Agron. Norte [Belém] **8**: 1–24. 29 Je 1946.

Fernald, M. L. Another aggressive hawkweed. Rhodora **50**: 15. 13 Ja 1948.

Fernald, M. L. A Nova Scotian dwarf shadbush. Rhodora **50**: 49–51. F 1948.

Fernald, M. L. A prostrate *Rorippa.* Rhodora **50**: 35. F 1948.

Flovik, Karl. The chromosome number of some species of *Carex* and *Eriophorum.* Nytt Mag. Naturvid. **83**: 77, 78. 27 Je 1942.

Giardelli, Maria Luisa. Nota sobre una Lemnácea tropical poco conocida: *"Wolffia Welwitschii"* Hegelm. Darwiniana **7**: 552–556. *1 map.* 17 S 1947.

Groh, H. Hackberry in and adjacent to the Province of Quebec. Canad. Field Nat. **61**: 141, 142. Jl–Au 1947.

Gustaffson, Åke. Polyploidy, life-form and vegetative reproduction. Hereditas **34**: 1–22. 23 Ja 1948.

Gutaffson, Åke. Apomixis in higher plants. Part II. The causal aspect of apomixis. Lunds Univ. Arssk. II. Sect. 2. **43**[2]: 71–179. *f. 21–29.* 23 My 1947. Part III. Biotype and species formation. **43**[12]: 183–371. 29 N 1947.

Habeeb, Herbert. *Campylium Halleri* in New Brunswick. Rhodora **50**: 52. F 1948.

Hara, Hiroshi. The nomenclature of the flowering dogwood and its allies. Jour. Arnold Arb. **29**: 111–115. 15 Ja 1948.

Hermann, Frederick J. Studies in *Lonchocarpus* and related genera, I: A synopsis of *Willardia*. Jour. Wash. Acad. **37**: 427–430. 31 D 1947.

Hermann, Frederick J. Studies in *Lonchocarpus* and related genera, II: Miscellaneous middle America *Lonchocarpi*. Jour. Wash. Acad. **38**: 11–14. 15 Ja 1948.

Hitchcock, C. Leo & Maguire, Bassett. A revision of the North American species of *Silene*. Univ. Wash. Publ. Biol. **13**: *i–iii*, 1–73. *pl. 1–8.* 31 Jl 1947.

Hultén, Eric. Flora of Alaska and Yukon—VII. Dicotylednoeae. Rosales III. (Geraniales, Sapindales, Parietales, Myrtiflorae, Umbelliflorae.) Lunds Univ. Arssk. II. Sect. 2 **43**[1]: 1069–1200. *f. 804–905.* 1947.

Ibarra, Florinda E. & La Porte, Juan. Las Crucíferas del género *Diplotaxis* adventicias en la Argentina. Revista Argent. Agron. **14**: 261–272. *f. 1–3.* D 1947.

Isely, Duane. *Lespedeza striata* and *L. stipulacea*. Rhodora **50**: 21–27. *pl. 1091, 1092.* F 1948.

Jonker, F. P. Alisamaceae [of Guiana]. *In:* Maguire, B. *et al.* Plant explorations in Guiana in 1944, chiefly to the Tafelberg and the Kaieteur Plateau. I. Bull. Torrey Club **75**: 81. 29 Ja 1948.

Krainz, H. *Lobivia vatterii* Krainz spec. nov. Sukkulentenkunde **1**: 7, 8. *2 f.* [Type: living pl. from Argentina]. Je 1947.

Lakela, Olga. Notes on Minnesota plant-life. Rhodora **50**: 19, 20. 13 Ja 1948.

Larsen, Eugene C. Photoperiodic responses of geographic strains of *Andropogon scoparius*. Bot. Gaz. **109**: 132–149. *f. 1–6.* D 1947 [30 Ja 1948].

Lawrence, William E. Chromosome numbers in *Achillea* in relation to geographic distribution. Am. Jour. Bot. **34**: 538–545. *f. 1–3 + table 1.* D 1947 [4 F 1948].

Lourteig, Alicia. Primulaceae argentinae. Addenda. Darwiniana **7**: 556–559. *pl. 1.* 17 S 1947.

Lundell, Cyrus Longworth. A new species of *Dracocephalum* L. from Texas. Wrightia **1**: 165. 15 D 1947.

Maguire, Bassett *et al.* Plant explorations in Guiana in 1944, chiefly to the Tafelberg and the Kaieteur Plateau—I. Bull. Torrey Club **75**: 56–115. *f. 1–13.* 29 Ja 1948. II. **75**: 189–230. *f. 14–17.* Mr. 1948.

McVaugh, Rogers. Generic status of *Triodanis* and *Specularia*. Rhodora **50**: 38–49. F 1948.

Merrill, E. D. On the control of destructive insects in the herbarium. Jour. Arnold Arb. **29**: 103–110. 15 Ja 1948.

Moore, Raymond J. Cytotaxonomic studies in the Loganiaceae. I. Chromosome numbers and phylogeny in the Loganiaceae. Am. Jour. Bot. **34**: 527–538. *f. 1–30 + tables 1, 2.* D 1947 [4 F 1948].

Palmer, Ernest J. Hybrid oaks of North America. Jour. Arnold Arb. **29**: 1–48. 15 Ja 1948.

Pearson, Norma L. Variations of floss characteristics among plants of *Asclepias syriaca* L. having different types of pods. Am. Midl. Nat. **38**: 615–637. *f. 1–7 + tables 1–5.* N 1947. [Ja 1948].

Peck, M. E. Native rhododendrons of the Pacific northwest. Rhododendron Yearb. **1947**: 87–89. 1947.

Pennell, Francis W. Some hitherto undescribed Scrophulariaceae of the Pacific States. Proc. Acad. Nat. **99**: 155–199. 5 N 1947.

Pohl, Richard W. A taxonomic study on the grasses of Pennsylvania. Am. Midl. Nat. **38**: 513–604. *1 map.* N 1947 [Ja 1948].

Ponce de León, Antonio. Joyas de la flora cubana. El corojo (*Acrocomia armentalis* Bailey). Revista Soc. Cub. Bot. **4**: 3. *1 pl.* Ja–Mr 1947.

Ponce de León y Carrillo, Patricio. *Nuphar advena Cubana* var. nova. Revista Soc. Cub. Bot. **4**: 9–16. *f. 1–13.* Ja–Mr 1947.

Porsild, Morten P. The Greenland *Achillea*. Medd. Grønland **134**: 36–39. *f. 7–9.* 27 Au 1947.

Porsild, Morten P. On *Carex rufina* Drejer. Medd. Grønland **134**: 26–36. *f. 5, 6.* 27 Au 1947.

Porsild, Morten P. *Potamogeton groenlandicus* Hagstrom. Medd. Grønland **134**: 18–26. *f. 3, 4.* 27 Au 1947.

Porsild, Morten P. *Potentilla hyparctica* Malte. Medd. Grønland **134**: 10–18. *f. 2.* 27 Au 1947.

Porsild, Morten P. What is *Antennaria Hansii* Kern? Medd. Grønland **134**: 3–9 *f. 1.* 27 Au 1947.

Quisumbing, Eduardo. Philippine plants used for arrow and fish poisons. Philipp. Jour. Sci. **77**: 127–177. Je 1947.

Raymond, Marcel. A red-fruited form of *Podophyllum peltatum*. Rhodora **50**: 18. 13 Ja 1948.

Riddle, Matthew C. *Iris innominata*—The Cinderella of the Pacific Coast irises. Jour. Calif. Hort. Soc. **9**: 13–18. Ja 1948.

Sherff, Earl Edward. Further studies in the genus *Dodonaea* L. (family Sapindaceae). Field Mus. Nat. Hist. Publ. Bot. **23**: 269–317. 22 D 1947.

Sherff, Earl Edward. A preliminary study of Hawaiian species of the genus *Rauvolfia* [Plum.] L. (family Apocynaceae). Field Mus. Nat. Hist. Publ. Bot. **23**: 321–331. 30 D 1947.

Sherff, Earl Edward. Additions to the genera *Scalesia* Arn. and *Hidalgoa* Llove and Lex. (family Compositae). Field Mus. Nat. Hist. Publ. Bot. **23**: 333–336. 30 D 1947.

Shinners, Lloyd H. Revision of the genus *Krigia* Schreber. Wrightia **1**: 187–206. 15 D 1947.

Shinners, Lloyd H. Two anomalous new species of *Erigeron* L. from Texas. Wrightia **1**: 183–186. 15 D 1947.

Skottsberg, C. Eine kleine Pflanzensammlung von San Ambrosio (Islas Desventuradas, Chile). Acta Hort. Gothob. **17**: 49–57. *f. 1–41.* 17 Je 1947.

Skottsberg, C. The genus *Peperomia* in Chile. Acta Hort. Gothob. **17**: 1–47. *f. 1–76.* 17 Je 1947.

Skottsberg, C. Notes on some annual species of *Adesmia* DC. from central Chile. Acta Hort. Gothob. **17**: 165–190. *f. 1–85.* 31 O 1947.

Stehlé, H. Notes taxonomiques et géographies sur des Graminées et Cypéràcées nouvelles des Antilles françaises. Not. Syst. [Paris] **13**: 72–97. Je 1947.

Svenson, Henry K. Cyperaceae [of Guiana]. *In:* Maguire, B. *et al.* Plant explor-

ations in Guiana in 1944, chiefly to the Tafelberg and the Kaieteur Plateau —I. Bull. Torrey Club **75**: 91–102. *f. 3, 4.* 29 Ja 1948.

Swallen, Jason R. Gramineae [of Guiana]. *In:* Maguire, B. *et al.* Plant explorations in Guiana in 1944, chiefly to the Tafelberg and the Kaieteur Plateau —I. Bull. Torrey Club **75**: 81–91. 29 Ja 1948.

Woodson, Robert E. Sone dynamics of leaf variation in *Asclepias tuberosa.* Ann. Mo. Bot. Gard. **34**: 353–432. *pl. 45, 46 + f. 1–15 + tables 1–14 + maps 1–6.* N 1947.

ECOLOGY AND PLANT GEOGRAPHY

Bechtel, A. R. A ten-year-old forest in Lye Creek prairie, Montgomery County [Indiana]. Proc. Ind. Acad. **56**: 80–83. *f. 1, 2.* 1947.

Bentley, J. R. & Talbot, M. W. Annual-plant vegetation of the California foothills as related to range management. Ecology **29**: 72–79. *f. 1.* Ja 1948.

Bruce, David. Thirty-two years of annual burning in longleaf pine. Jour. Forest. **45**: 809–814. *f. 1–4.* N 1947.

Buell, Murray F. Mass dissemination of pine pollen. Jour. Elisha Mitchell Soc. **63**: 163–167. *f. 1, 2.* D 1947.

Daubenmire, Rexford F. Plants and environment, a textbook of plant autecology. *i-xiii,* 1–424. *illust.* Wiley. New York. 1947.

Good, Ronald. The geography of the flowering plants. 1–403. *pl. 1–24 + f. 1–71.* Longmans, Green & Co. London and New York. 1947.

Penfound, William T. A phytosociological analysis of a goldenrod community near Kenner, Louisiana. Ecology **29**: 124, 125. *table 1.* Ja 1948.

Potts, Roberta & Penfound, William T. Water relations of the polypody fern, *Polypodium polypodioides* (L.) A. S. Hitchcock. Ecology **29**: 43–53. *f. 1–4 + tables 1–3.* Ja 1948.

Reed, John F. The relation of the Spartinetum glabrae near Beaufort, North Carolina to certain edaphic factors. Am. Midl. Nat. **38**: 605–614. *tables 1, 2.* N 1947 [Ja 1948].

Weaver, J. E. & Darland, R. W. Changes in vegetation and production of forage resulting from grazing lowland prairies. Ecology **29**: 1–20. *f. 1–28.* Ja 1948.

PHYTOPATHOLOGY

Baker, Kenneth F. Seed transmission of *Rhizoctonia solani* in relation to control of seedling damping-off. Phytopathology **37**: 912–924. *f. 1, 2.* D 1947.

Bever, Wayne M. Physiologic races of *Ustilago tritici* in the eastern soft wheat region of the United States. Phytopathology **37**: 889–895. *f. 1–3.* D 1947.

Cooley, J. S. Natural infection of replanted apple trees by white root rot fungus. Phytopathology **38**: 110–113. *table 1.* F 1948.

Crandall, Bowen S. *Cinchona* root disease caused by *Phytophthora cinnamomi.* Phytopathology **37**: 928, 929. D 1947.

Crandall, Bowen S. *Phytophthora cinnamomi* root rot of avocados under tropical conditions. Phytopathology **38**: 123–130. *f. 1.* F 1948.

Demaree, J. B. *Thelephora terrestris* on blueberry plants. Phytopathology **37**: 930, 931. *f. 1.* D. 1947.

Dunegan, John C. The occurrence of *Monilinia Seaveri* on English morello cherry. Phytopathology **37**: 929, 930. *f. 1.* D 1947.

Ergyle, David R. The carbohydrate metabolism of germinating *Phymatotrichum*

sclerotia with special reference to glycogen. Phytopathology **38**: 142–151. *f. 1–3 + tables 1, 2.* F 1948.

Fenner, Lawrence M. & Fate, Leston R. *Ceratostomella ulmi* on elm bark treated with 2,4-dichlorophenoxyacetic acid. Phytopathology **37**: 925–928. *f. 1–3.* D 1947.

Foster, H. H. & Pinckard, J. A. Control of cabbage downy mildew with benzene vapor. Phytopathology **37**: 896–911. *f. 1–3 + tables 1–7.* D 1947.

Hartzell, Albert. Additional tests of plant products for insectidal properties and summary of results to date. Contr. Boyce Thompson Inst. **15**: 21–34. *tables 1–4.* O–D 1947.

Hoppe, P. E. Seed treatment with mercury dusts injurious to corn with mechanical injuries near embryo. Phytopathology **38**: 81. *f. 1.* Ja 1948.

Huber, Glenn A. & Gould, C. J. *Sclerotium delphinii* Welch on scilla. Phytopathology **38**: 82–85. *f. 1.* Ja 1948.

Kreitlow, K. W. *Urocystis agropyri* on *Phleum pratense.* Phytopathology **38**: 158, 159. F 1948.

MacLean, Neil Allan. *Rhizoctonia* rot of tulips in the Pacific northwest. Phytopathology **38**: 156, 157. *f. 1.* F 1948.

Mader, E. O. & Feldman, A. W. Physiological exhaustion of strawberry plants as a factor in winter killing. Phytopathology **38**: 137–141. F 1948.

Martin, W. J. The occurrence of South American leaf blight of *Hevea* rubber trees in Mexico. Phytopathology **38**: 157, 158. F 1948.

Miller, V. L., Johnson, Folke & Allmendinger, D. F. Fluorine analysis of Italian prune foliage affected by marginal scorch. Phytopathology **38**: 30–37. *f. 1, 2 + tables 1–3.* Ja 1948.

Newhall, A. G. & Lear, Bert. Soil fumigation for fungus control with methyl bromide. Phytopathology **38**: 38–43. *f. 1, 2 + tables 1–5.* Ja 1948.

Nienow, Inez. The indentification and characterization of a virus causing mosaic in *Mertensia virginia.* Phytopathology **38**: 62–69. *f. 1 + tables 1–4.* Ja 1948.

Rhoades, Arthur, S. *Clitocybe* root rot of citrus trees in Florida. Phytopathology **38**: 44–61. *f. 1–6.* Ja 1948.

Siggers, Paul V. Temperature requirements for germination of spores of *Cronartium fusiforme.* Phytopathology **37**: 855–864. *f. 1 + tables 1, 2.* D 1947.

Sprague, Roderick. *Gloeosporium* decay in Gramineae. Phytopathology **38**: 131–136. *f. 1.* F 1948.

Stoddard, David L. Nitrogen, potassium, and calcium in relation to *Fusarium* wilt of muskmelon. Phytopathology **37**: 875–884. *f. 1 + tables 1–7.* D 1947.

Szkolnik, Michael. Antagonistic activity of a species of *Actinomyces* against *Ceratostomella ulmi* in vitro. Phytopathology **38**: 85–87. *f. 1.* Ja 1948.

Thirumalacher, M. J. & Dickson, J. G. A *Physoderma* disease of quack grass. Phytopathology **37**: 885–888. *f. 1, 2.* D 1947.

Thomas, Harold E. *et al.* Rootstock susceptibility to *Armillaria mellea.* Phytopathology **38**: 152–154. *tables 1, 2.* F 1948.

Tompkins, C. M. & Hansen, H. N. *Cyclamen* petal spot, caused by *Botrytis cinerea* and its control. Phytopathology **38**: 114–117. *f. 1, 2.* F 1948.

Tompkins, C. M. & Tucker, C. M. Stem rot of *Dieffenbachia picta* caused by *Phytophthora palmivora* and its control. Phytopathology **37**: 868–874. *f. 1–4.* D 1947.

Whitaker, Thomas W. & Pryor, Dean E. Correlated resistance of leaves, cotyledons, and stems of *Cucumis melo* L. to cantaloupe powdery mildew (*Erysiphe cichoracearum* DC.) Phytopathology **37**: 865–867. *table 1.* D 1947.

MORPHOLOGY

(including anatomy & cytology in part)

(See also under Fungi & Lichens: **Ajello**; under Spermatophytes: **Buchholz & Gray**)

Bailey, I. W. & Nast, Charlotte G. Morphology and relationships of *Illicium*, *Schisandra* and *Kadsura*. I. Stem and leaf. Jour. Arnold Arb. **29**: 77–89. *pl. 1–6*. 15 Ja 1948.

Giles, N. H. Chromosome structural changes in *Tradescantia* microspores produced by absorbed radiophosphorus. Proc. Nat. Acad. **33**: 283–287. O 1947.

Granick, S. & Porter, K. R. The structure of the spinach chloroplast as interpreted with the electron microscope. Am. Jour. Bot. **34**: 545–550. *f. 1–6*. D 1947. [4 F 1948].

Heintzelman, Charles E. & Howard, Richard A. The comparative morphology of the Icacinaceae. V. The pubescence and the crystals. Am. Jour. Bot. **35**: 42–52. *f. 1–64 tables 1, 2*. Ja [F] 1948.

Kaufmann, Berwind, P. Chromosome structure in relation to the chromosome cycle. II. Bot. Rev. **14**: 57–126. F 1948.

Lemos Pereira, Alice de. Sobre o citoplasma e a membrana da célula vegetal. Bol. Soc. Brot. II. **17**: 167–181. *pl. 1–10*. 1943.

Madsen, Grace C. Influence of photoperiod on microsporogenesis in *Cosmos sulphureus* Cav. var. Klondike. Bot. Gaz. **109**: 120–132. *f. 1–34*. D 1947 [30 Ja 1948].

Maheshwari, P. The angiosperm embryo sac. Bot. Rev. **14**: 1–56. Ja 1948.

Mendes, Luiz O. T. Investigações preliminares sôbre o duplicação do número de cromosomios da seringueira pela ação do colchicina. Bol. Téc. Inst. Agron. Norte [Belém] **7**: 1–60. 27 Je 1946.

Pearson, Norma L. Observations on seed and seed hair growth in *Asclepias syriaca* L. Am. Jour. Bot. **35**: 27–36. *f. 1–22*. Ja [F] 1948.

Puri, V. Studies in floral anatomy. IV. Vascular anatomy of the flower of certain species of Passifloraceae. Am. Jour. Bot. **34**: 562–573. *f. 1–6*. D 1947 [4 F 1948].

Reeve, R. M. The "tunica-corpus" concept and development of shoot apices in certain dicotyledons. Am. Jour. Bot. **35**: 65–75. *f. 1–26*. Ja [F] 1948.

Ritchie, Don. The formation and structure of the zoospores in *Allomyces*. Jour. Elisha Mitchell Soc. **63**: 168–205. *pl. 22–26*. D 1947.

Tjio, Joe Hin. The somatic chromosomes of some tropical plants. Hereditas **34**: 135–146. *f. 1, 2*. 23 Ja 1948.

Wang, F. H. Life history of *Keteleeria*. I. Strobili, development of the gematophytes and fertilization in *Keteleeria evelyniana*. Am. Jour. Bot. **35**: 21–27. *f. 1–38 + table 1*. Ja [F] 1948.

GENETICS

(including cytogenetics)

(See also under Spermatophytes: **Gustafsson**)

Anderson, Edgar. Field studies of Guatemalan maize. Ann. Mo. Bot. Gard. **34**: 433–467. N 1947.

Atchison, Earlene. Cytogeography of *Gleditsia* and *Mitchella*. Jour. Hered. **38**: 311, 312. *f. 9*. O 1947 [Ja 1948].

Barton, Lela V. Effect of different storage conditions on the germination of seeds of *Cinchona Ledgeriana* Moens. Contr. Boyce Thompson Inst. **15**: 1–10. O–D 1947 [F 1948].

Cameron, James W. Chemico-gemetic bases for the reserve carbohydrates in maize endosperm. Genetics **32**: 459–485. *pl. I–III + f. 1–3.* S [15 N] 1947.

Fuller, Thomas C. Effects of several sulfa-compounds on nuclear and cell divisions. Bot. Gaz. **109**: 177–183. *f. 1–18.* D 1947 [30 Ja 1948].

Hirsch, H. E. Cytological phenomena and sex in *Hypomyces solani* f. *cucurbitae.* Proc. Nat. Acad. **33**: 268–270. S 1947.

Kerns, K. R. & Collins, J. L. Chimeras in the pineapple. Jour. Hered. **38**: 323–330. *f. 1–6.* N 1947 [F 1948].

Kohler, George W. *et al.* Selection and breeding for high β-carotene content (provitamin A) in tomato. Bot. Gaz. **109**: 219–225. D 1947 [30 Ja 1948].

Langham, D. G. Genetics of *Sesame.* V. Some morphological differences of the sesame flower (*S. indicum* L.). Jour. Hered. **38**: 347–352. *f. 14–16.* N 1947 [F 1948].

Mangelsdorf, Paul C. The inheritance of amylaceous sugary endosperm and its derivatives in maize. Genetics **32**: 448–458. *f. 1, 2.* S [15 N] 1947.

Mehlquist, Gustav A. L. Polyploidy in the genus *Paphiopedilum* Pfitz. (*Cypripedium* Hort.), and its practical implications. Mo. Bot. Gard. Bull. **35**: 211–225. *f. 1–7 + tables 1, 2 + chart 1, 2.* D 1947.

Ware, J. O., Benedict, L. I. & Rolfe, W. H. A recessive naked-seed character in upland cotton. Jour. Hered. **38**: 313–320. *f. 10, 11,* O 1947 [Ja 1948].

PLANT PHYSIOLOGY

(See also under Fungi and Lichens: **Barnett & Lilly**; under Spermatophytes: **Larsen**; under Phytopathology: **Ergyle**)

Bernstein, Leon & Thompson, John F. Studies on the carotene-destroying process in drying bean leaves. Bot. Gaz. **109**: 204–219. *f. 1–10.* D 1947 [30 Ja 1948].

Boatner, C. H. *et al.* Pigment glands of cottonseed. III. Distribution and some properties of cottonseed pigments. Bot. Gaz. **109**: 108–120. *f. 1–3.* D 1947 [30 Ja 1948].

Buell, Caroline B. & Weston, William H. Application of the mineral oil conservation method to maintaining collections of fungous cultures. Am. Jour. Bot. **34**: 555–561. *f. 1 + table 1.* D 1947 [4 F 1948].

Burton, Daniel F. Formative effects of certain substituted chlorophenoxy compounds on bean leaves. Bot. Gaz. **109**: 183–194. *f. 1–6.* D 1947 [30 Ja 1948].

Chao, Marian Dellers & Loomis, W. E. Temperature coefficients of cell enlargement. Bot. Gaz. **109**: 225–231. D 1947 [30 Ja 1948].

De Ropp, R. S. The growth-promoting action of bacteria-free crown-gall tumor tissue. Bull. Torrey Club **75**: 45–50. *tables 1–4.* 29 Ja 1948.

Edwards, George A., Buell, Caroline B. & Weston, William H. The influence of mineral oil upon the oxygen consumption of *Sordaria fumicola.* Am. Jour. Bot. **34**: 551–555. *f. 1–4.* D 1947 [4 F 1948].

Goodwin, Richard H. & Kavanagh, Frederick. Fluorescing substances in roots. Bull. Torrey Club **75**: 1–17. *f. 1–5 + tables 1, 2.* 29 Ja 1948.

Goodwin, Richard H. & Owens, Olga v. H. An action spectrum for inhibition of the first internode of *Avena* by light. Bull. Torrey Club **75**: 18–21. *f. 1.* 29 Ja 1948.

Gottlieb, David & Anderson, H. W. The respiration of *Streptomyces griseus.* Science **107**: 172, 173. 13 F 1948.

Hausman, Ethel Hinckley. Measurements of the annual growth-rate of two species of rock lichens. Bull. Torrey Club **75**: 116, 117. *table 1.* 29 Ja 1948.

Kelly, Sally. The relationship between respiration and water uptake in the oat coleoptile. Am. Jour. Bot. 34: 521–526. *f. 1–4 + tables 1–4.* D 1947 [4 F 1948].

Penfound, William T. & Minyard, Virginia. Relation of light intensity to effect of 2, 4-dichlorophenoxyacetic acid on water hyacinth and kidney bean plants. Bot. Gaz. **109:** 231–234. D 1947 [30 Ja 1948].

Sivori, Enrique M. Fotoperiodismo de *Chenopodium Quinoa* Willd.—Reacción de la cigota y gametófito femenino. Darwiniana **7:** 541–551. 17 S 1947.

Stewart, W. S. & Klotz, L. S. Some effects of 2,4-dichlorophenoxyacetic acid on fruit-drop and morphology of oranges. Bot. Gaz. **109:** 150–162. *f. 1–7.* D 1947 [30 Ja 1948].

Stuhlman, Otto. A physical analysis of the opening and closing movements of the lobes of the Venus' fly-trap. Bull. Torrey Club **75:** 22–24. *f. 1–13.* 29 Ja 1948.

Tam, R. K. Comparative herbicidal value of 2,4-dichlorophenoxyacetic acid and 2,4,5-trichlorophenoxyacetic acid on some herbaceous weeds, shrubs, and trees under Hawaiian conditions. Bot. Gaz. **109:** 194–203. *f. 1–3.* D 1947 [30 Ja 1948].

Taylor, D. L. Effects of 2,4-dichlorophenoxyacetic acid on gas exchange of wheat and mustard seedlings. Bot. Gaz. **109:** 162–176. *f. 1–3.* D 1947 [30 Ja 1948].

Texera, Diego A. Production of antibiotic substances by *Fusaria.* Phytopathology **38:** 70–81. *tables 1–5.* Ja 1948.

Tiedjens, V. A. Relationships of ampholytes to assimilation and recovery of ammonium and nitrate nitrogen in plant tissue. Bot. Gaz. **109:** 95–107. *f. 1–6.* D 1947 [30 Ja 1948].

Westergaard, Mogens & Mitchell, Herschel K. *Neurospora* V. A synthetic medium favoring sexual reproduction. Am. Jour. Bot. **34:** 573–577. *f. 1 + tables 1–6.* D 1947 [4 F 1948].

Whitford, L. A. A study of some algal pigments. Jour. Elisha Mitchell Soc. **63:** 135–162. *f. 1–3.* D 1947.

Zimmerman, P. W. & Hartzell, Albert. Hexaethyl tetraphosphate and tetraethyl pyrophosphate: I. Their effects on plants. II. Their toxicities to insects and mites. Contr. Boyce Thompson Inst. **15:** 11–19. *f. 1 + tables 1–3.* O–D 1947.

GENERAL BOTANY
(including Biography)

Acuña, Julián. Datos biográficos del Dr. Juan Tomás Roig y Mesa. Revista Soc. Cub. Bot. **4:** 4–8. Ja-Mr 1947.

Bailey, Liberty Hyde. Botanical sciences and their applications, including agriculture. Proc. Am. Philos. Soc. **91:** 22–26. 1947.

Chardon, Carlos E. La contribución del doctor Roberto E. Fries a los estudios botánicos del Nuevo Mundo. Darwiniana **7:** 497–503. *port.* S 1947.

Dodge, B. O. Robert Almer Harper. Proc. Linn. Soc. **158:** 134–136. 29 Jl 1947.

Ferreira Reis, A. C. O Jardin Botánico de Belém. Bol. Mus. Nac. [Rio de Janeiro] **7:** 1–14. 1946.

Flowers, Seville. A visit with Dr. Grout. Bryologist **50:** 208–212. *f. 1, 2.* Je [Jl] 1947.

Freeman, Grace Gibson. Knowing plants vs. knowing their names only. Castanea **12:** 74–76. S [N] 1947.

Harvey, Athelstan George. Douglas of the fir, a biography of David Douglas, botanist. *i–x*, 1–290. *illust.* Harvard Univ. Press. Cambridge. 1947.

Hawkes, J. G. La historia de la papa. Bol. Soc. Venez. Ci. Nat. **10:** 383–394. O–D 1946.

Hawkes, J. G. On the origin and meaning of South American Indian potato names. Jour. Linn. Soc. **53:** 205–250. 20 O 1947.

Higbee, E. C. *Lonchocarpus*—a fish-poison insecticide. Econ. Bot. **1:** 427–436. *f. 1–7.* 1947.

Karper, R. E. & Quinby, J. R. Sorghum—its production, utilization and breeding. Econ. Bot. **1:** 355–371. *f. 1–10.* O–D 1947.

Lombard, Frances F. Review of literature on *Cinchona* diseases, injuries, and fungi. U. S. Dep. Agr. Bibliogr. Bull. **9:** 1–70. D 1947.

Mayr, Ernst. Ecological factors in speciation. Evolution **1:** 263–288. D 1947.

Miller, William Hubert. Mark Catesby, an eighteenth century naturalist. Tyler's Quart. Hist. & Geneal Mag. **29:** 167–180. Ja 1948.

Munz, Philip A. A short history of the Rancho Santa Ana Botanic Garden. 1–31. *illust.* Los Angeles. M 1947.

Ponce de Leon, Antonio. El Hermano León. Revista Soc. Cub. Bot. **3:** 148–151. N–D 1946.

Quintana, Raúl. Breve resena sobre botánica americana. 1–52 *illust.* Buenos Aires. 1945.

Riquelma Inda, Julio. Los naturalistas en la provincia. Revista Soc. Mex. Hist. Nat. **7:** *1–6.* D 1946.

Roak, R. C. Some promising insecticidal plants. Econ. Bot. **1:** 437–445. *f. 1–3.* 1947.

Schnooberger, Irma. Moss Rock Cabin [and Dr. Grout]. Bryologist **50:** 213–217. Je [Jl] 1947.

Schuster, C. E. Edible nuts of the Pacific northwest. Econ. Bot. **1:** 389–393. *f. 1–3.* 1947.

Sparn, Enrique. Cronología, diferenciación, matrícula y distribución geográfica de las sociedades botánicas. Bol. Acad. Nac. Ciene. [Córdoba] **36:** 1–24. 1942.

Spencer, Claude F. *et al.* Survey of plants for antimalarial activity. Lloydia **10:** 145–174. *table 1.* S [O] 1947.

Stearn, William T. Endlicher's "Genera Plantarum," "Inconographia Generum Plantarum" and "Atakta Botanika." Jour. Arnold Arb. **28:** 424–429. 15 O 1947.

Stevens, Neil E. Factors in botanical publication and other essays. Chron. Bot. **11:** 122–204. 1947.

Tiffany, Lewis Hanford. Edmund Ware Sinnott: President of AAAS, 1948. Science **107:** 1. 2 Ja 1948.

Waller, Adolph E. Daniel Drake as a pioneer in modern ecology. Ohio St. Arch. & Hist. Quart. **56:** 362–373. O 1947.

Weatherby, C. A. Robert A. Ware. Am. Fern Jour. **37:** 65–67. *pl. 2.* Jl–S [O] 1947.

Wolf, Frederick A. & Wolf, Frederick T. The origin of tobaccos of the oriental type. Bull. Torrey Club **75:** 51–55. *f. 1–3.* 29 Ja 1948.

Woodward, E. F. Botanical drugs—a brief review of the industry with comments on recent developments. Econ. Bot. **1:** 402–414. *f. 1–4.* 1947.

Youngken, H. W. Ergot—a blessing and a scourge. Econ. Bot. **1:** 372–380. *f. 1–6.* 1947.